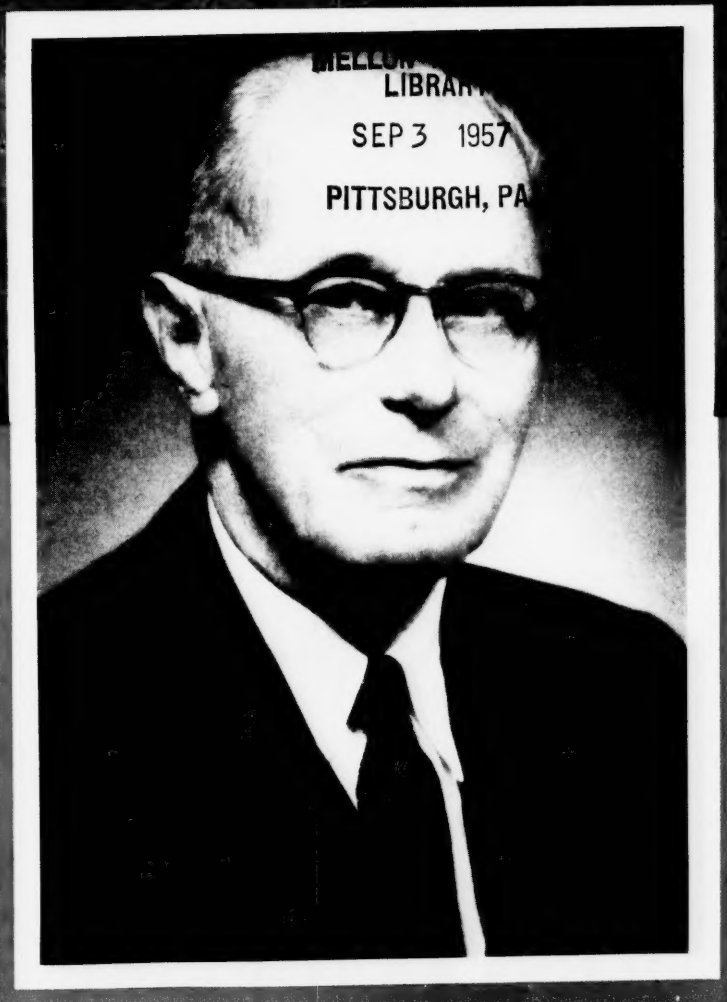
Metals Review

The News Digest Magazine

Published by the American Society for Metals

LIBRARY
SEP 3 1957
PITTSBURGH, PA



August 1957

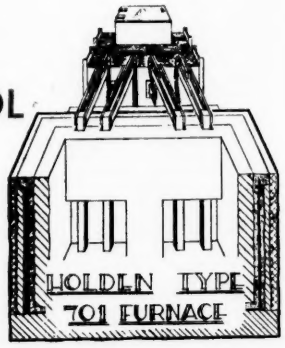
Frank T. Sisco
Chairman, Metallurgical
Reconstruction Committee
(See Article, p. 4)

HOLDEN METALLURGICAL PRODUCTS

are MONEY MAK-ERS for INDUSTRY

JOIN THE PARADE

HOLDEN Salt Baths = QUALITY CONTROL



ADDITIVES REPLACE.....
1. Carbon Rods
2. Rectifiers
3. Gas Rectifiers

DOWN TIME ..... How much per day?

DOWN TIME WITH ADDITIVES ..... NONE!

How YOU can change to HOLDEN Salt Baths with Additives–

1. Send 1 lb. sample of salt in furnace.
2. Send 1 lb. sample of salt as purchased.

We will furnish (FREE) correct additives with original purchase order.

Purchase and add HOLDEN SALT BATH QUALITY CHEMISTRY to your production operations.

Non-Explosive Tempering Salt Bath 600 to 1200° F Osquench 3300-10

FREE Holden Literature: (NEW)

#200—Holden Salt Baths
#201—Holden Pot Furnaces
#203—Rubber Mold Cleaning, Paint Removal, Descaling & Desanding
#204—Pressure Nitriding
#205—Industrial Furnaces
#206—Austempering-Martempering
#207—NEW—Recirculation Radivection Furnace . . . 300° to 1750° F.

☐ WE ARE INTERESTED IN YOUR LEASING PLAN FOR INDUSTRIAL FURNACES

LEASING CONSERVES WORKING CAPITAL AND INCREASES PROFITS

HOLDEN
METALLURGICAL PRODUCTS
TRADE MARK REGISTERED

THE A. F. HOLDEN COMPANY

3 F.O.B. Points for Holden Metallurgical Products

EASTERN PLANT
• 460 GRAND AVENUE, NEW HAVEN 13, CONN.

EXECUTIVE OFFICES AND PLANT
• 14341 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN

WESTERN PLANT
• 4700 EAST 48th STREET, LOS ANGELES 58, CALIF.

Metals Review

The News Digest Magazine

August 1957

Volume XXX, No. 8

Ray T. Bayless, Publishing Director

Betty A. Bryan, Editor

A. P. Ford, Sales Manager

G. H. Loughner, Production Manager

Marjorie R. Hyslop, Editor
A.S.M. Review of Metal Literature

●

DISTRICT SALES MANAGERS

William J. Hilty
7301 Euclid Ave., Cleveland 3, Ohio
UTah 1-0200

John B. Verrier, Jr.
Fred Stanley
342 Madison Ave., Room 1228
New York 17, N. Y.
OXford 7-2667

Donald J. Walter
20050 Livernois St.
Detroit 21, Mich.
UNiversity 4-3861

Victor D. Spatafora
53 West Jackson Blvd.
Chicago 4, Ill.
WAbash 2-7822

●

Published monthly by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio: D. S. Clark, President; G. M. Young, Vice-President; C. H. Lorig, Treasurer; W. H. Eisenman, Secretary; G. E. Shubrooks, H. A. Wilhelm, G. A. Fisher and Carl E. Swartz, Trustees; A. O. Schaefer, Past President. Subscriptions $5.00 per year ($6.00 foreign). Single copies $1.00. Entered as Second Class Matter, July 26, 1930 at the Post Office at Cleveland, Ohio, under the Act of March 3, 1879.

Claims for missing numbers will not be allowed if received more than 60 days from date of issue. No claims allowed from subscribers from overseas, or because of failure to notify the circulation department of a change of address or because copy is "missing from files".

Sisco Heads Documentation Committee 4
1957 A.S.M. Preprints 6
Chapter Officers, 1957-58 8
Top Science Achievement Awards Winners 18
Progress in Metallurgical Education, by Walter Morrison 19

Important Lectures

Super-High-Strength Structural Steels, by A. E. Nehrenberg 16
Canton-Massillon Panel on Vacuum Melting 17
Vacuum Metal Metallurgy, by A. M. Aksoy 21
Feedback in Scientific Creativity, by M. J. Day 22
Production Planning Steps in an Integrated Steel Plant, by A. E. Lawrence 23
Trace Elements in Metal, by Jerome Strauss 24

Departments

Compliments 16
Obituaries 17
New Films 18
Men of Metal 20
Metallurgical News 25
Employment Service Bureau 74

ASM Review of Metal Literature

A — GENERAL METALLURGY 26
B — ORE AND RAW MATERIAL PREPARATION 28
C — EXTRACTION AND REFINING 29
D — IRON AND STEELMAKING 30
E — FOUNDRY 31
F — PRIMARY MECHANICAL WORKING 36
G — SECONDARY MECHANICAL WORKING (FORMING AND MACHINING) 37
H — POWDER METALLURGY 39
J — HEAT TREATMENT 39
K — ASSEMBLING AND JOINING 41
L — CLEANING, COATING AND FINISHING 45
M — METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES 49
N — TRANSFORMATIONS AND RESULTING STRUCTURES 51
P — PHYSICAL PROPERTIES 54
Q — MECHANICAL PROPERTIES AND TESTS 56
R — CORROSION 62
S — INSPECTION AND CONTROL 65
T — METAL PRODUCTS AND PARTS 68
W — PLANT EQUIPMENT 70
X — INSTRUMENTATION—LABORATORY AND CONTROL EQUIPMENT 72

Sisco Heads Metallurgical Documentation Committee

Frank T. Sisco, director of the Engineering Foundation, is the first chairman of the new A.S.M. Metallurgical Documentation Committee. This committee will have responsibility for advising and coordinating all activities of the American Society for Metals in the fields of abstracting, literature classification and searching, and bibliographic services.

Such activities will be greatly accelerated in the next few years when it is anticipated that the A.S.M. Pilot Plant Experiment in Machine Literature Searching at Western Reserve University will be complete and will result in a greatly expanded literature service for A.S.M. members and for industry. Such services will play an important and even essential role in the "A.S.M. of Tomorrow".

The new committee was established by the Board of Trustees at its meeting in Los Angeles in March 1957. Personnel of the committee, headed by Mr. Sisco, is as follows:

Wallace R. Brode, Associate Director, National Bureau of Standards, Washington

Dolph G. Ebeling, Manager, Metallurgy Unit, Materials and Processes Laboratory, Large Steam Turbine-Generator Dept., General Electric Co., Schenectady, N. Y.

Herman Henkle, Chief Librarian, John Crear Library, Chicago

D.C. Hilty, Manager, Research Information, Metals Research Laboratories, Electro Metallurgical Co., Niagara Falls, N. Y.

Irving H. Jenks, Head, Publications Division, Aluminium Laboratories Limited, Kingston, Ontario

George A. Roberts, Vice-President in Charge of Technology, Vanadium-Alloys Steel Co., Latrobe, Pa.

Amos J. Shaler Head, Dept. of Metallurgy, Pennsylvania State University

John W. W. Sullivan, Metallurgical Engineer, American Iron and Steel Institute, New York

E. E. Thum, Editor, *Metal Progress*, Cleveland (Ex officio)

Marjorie R. Hyslop, American Society for Metals, Cleveland—Secretary

Frank Sisco's interests turned to metallurgy immediately following graduation with a B.Sc. degree in inorganic chemistry. In 11 years he held jobs with four steel companies, as chemist, chief chemist, engineer of tests, openhearth observer, melter, melter foreman and assistant superintendent. Most of this experience was in the production of basic electric-furnace steel ingots.

His first job with the title of metallurgist began in 1923 with the U.S. Army Air Corps at McCook Field, Dayton, Ohio. When the Air Corps moved its engineering division to Wright Field in 1925, he was made chief of the Metals Branch, which included the metallographic and radiographic laboratories, the experimental heat treatment laboratory and the experimental foundry.

The Metals Branch at Wright Field pioneered in many of the outstanding developments in aircraft metallurgy which occurred between 1925 and 1930. It was primarily responsible for the development of an Al-Mg-Ni alloy for pistons and air-cooled cylinder heads and for the development of a successful salt-cooled valve. It carried on the original research work which led to the use of welded chromium-molybdenum steel tubing for aircraft fuselages and wings—a development which was responsible for the rapid abandonment of plywood and fabric construction. It also played a vital role in making the duralumin propeller practical.

Mr. Sisco left Wright Field in January 1930 to become editorial director of Alloys of Iron Research in New York City. This project, now in its 27th year, is devoted to collecting, evaluating and summarizing the research work of the world, as reported in the literature, on the metal iron and on carbon and alloy steels. Fifteen volumes have been published and two more are in preparation.

From 1942 to 1946, Alloys of Iron Research was mostly dormant and during this time he served temporarily as secretary of the Metals Division of the American Institute of Mining and Metallurgical Engineers. Alloys of Iron Research was reactivated in 1946 under his direction. In 1949 he was appointed director of the Engineering Foundation, and all of the editorial work on manuscripts for the Alloys of Iron monographs was turned over to Mrs. Sisco, who has been assistant editor, bibliographer and linguist for the project since its inception in 1930.

The Engineering Foundation work includes the supervision of 25 to 30 research projects in all fields of engineering. Foundation projects are primarily in basic research or in applied research, provided the results have industry-wide value.

Frank helped organize the Charleston, W. Va. Chapter A.S.M. in 1921 and the Dayton Chapter in 1926. He served as a national trustee in 1929 and 1930. He prepared two series of educational articles for the A.S.S.T. *Transactions* in the 1920's, which, when reprinted, was among the earliest books published by the Society.

His long experience in the problems of locating and classifying metallurgical literature, gained with Alloys of Iron Research, and his broad engineering outlook give him an admirable background for heading up the new committee on documentation. He also served as a member of the A.S.M.-S.L.A. Committee on Metallurgical Literature Classification in 1950, and as chairman of the second literature classification committee which has just completed a revision and expansion of the classification, which will henceforth be known as the A.S.M. International Metallurgical Classification.

The new committee on metallurgical documentation will absorb the Special Committee on Mechanized Literature Searching which has served in an advisory capacity for the Machine Literature Searching Project at Western Reserve University for the past two years under the chairmanship of D. C. Hilty, Manager, Research Information, Metals Research Laboratories, Electro Metallurgical Company, Niagara Falls, N. Y.

1957-58 Columbus Officers Elected

Newly Elected Officers of the Columbus Chapter for the Coming Season Include, From Left: John G. Kura, Battelle Memorial Institute, Treasurer; Gerald K. Wood, North American Aviation, Inc., Chairman; Thomas L. Chase, Electric Heat Treating Co., Vice-Chairman; and R. E. (Ernie) Christin, Electric Heat Treating Co., Secretary. (Reported by R. E. Christin)

MELLON INSTITUTE
LIBRARY
SEP 3 1957
URGH, PA.

Rockford Holds Heat Treating Course

A Well-Packed Lecture Hall Demonstrates Pictorially the Popularity of the Educational Lecture Series on "Heat Treating—Principles, Practices and Methods" Which Was Recently Completed by the Rockford Chapter A.S.M.

The **Rockford Chapter,** in cooperation with the Rockford Men's College, sponsored an educational course on "Heat Treating—Principles, Practices and Methods". The course consisted of five two-hour evening sessions and was held in the Talcott Chapel of Rockford Men's College, which included the course as part of its curriculum and gave credit for completion.

Average attendance for the five lectures was 155, with a total enrollment of 189 students for the course. The enrollment consisted of 19 A.S.M. members and 170 nonmembers. The Chapter was able to contact and acquaint a large number of men with the A.S.M. and enlist the attention of several potential members. Included in the registration were teachers, heat treaters, metallurgists, platers and assemblers. The attendance at this year's educational sessions was more than double previous enrollments.

The registration fee for the course was $6, which included a copy of "Principles of Heat Treatment", by M. Grossmann, five two-hour sessions, and a complimentary ticket for a dinner at a regular chapter meeting which followed the completion of the course.

The five lectures included in the course were as follows:

Introduction to Heat Treating, by C. H. Muehlemeyer, president and general manager, O. T. Muehlemeyer Heat Treating Co.

General Heat Treating Equipment for Complete Piece Temperature Uniformity, by E. J. Pavesic, field metallurgist, Lindberg Steel Treating Co.

Temperature Measurement and Control, by Bruno Ramthun, Wheelco Division, Barber-Colman Co., and James Dunlap, industry sales manager, Minneapolis-Honeywell Manufacturing Co.

Selective or Localized Heat Treating, by Robert J. Binder, supervisor of heat treating laboratory, Chrysler Corp.

Surface Treatment of Metals, by Art Eklund, Jr., president, Eklund Metal Treating Co.—**Reported by Karl E. Hein for Rockford.**

A.S.M. Makes Film

Premiere showing of "The Metals Information Center of Tomorrow," a 16mm. color motion picture depicting A.S.M.'s Mechanized Literature Searching Project, will be at the booth of Western Reserve University's Center for Documentation and Communications Research, at the 39th Metal Show in Chicago.

The film was "shot" in July at WQED, Pittsburgh educational television station. The electronic machine for "searching" metallurgical literature, being perfected at Western Reserve University under a five-year $75,000 A.S.M. grant, was shipped to Pittsburgh for the filming. Since the movie also depicts the work of abstracting, classifying, and entering on punched cards of metallurgical literature references—a complete library of 300 A.S.M. technical books also was sent to Pittsburgh for the movie.

"Plot" of the new film is simple, yet detailed: A man with a metallurgical research "problem" enters, defines his problem. Then the "search" for references begins, with a narrator describing steps in the process.

Past President George A. Roberts appears at the film's climax to describe what the searching project means to the A.S.M. of Tommorrow. Following the Metal Show, the movie will be available for chapter and public showings.

Student Receives Chapter Scholarship

Thomas Allman Was the Recipient of the First Scholarship to be Sponsored by Canton-Massillon Chapter. The $200 award is named in honor of a deceased secretary of the chapter, Louis A. Zeitz, and is being offered annually to local high-school students of high scholastic ability who intend to study engineering. Mr. Allman won out from among 20 well-deserving contestants. Offering the award to Mr. Allman is Wells E. Ellis, chairman, while, from left, Chester F. Jatczak, chairman of the student affairs committee, Wayne H. Carson, former employer of Mr. Zeitz, and Mrs. Louis Zeitz, look on. (Reported by Chester F. Jatczak for the Canton-Massillon Chapter)

1957 Preprint List

Papers for Presentation at the National Metal Congress Chicago, Nov. 4-8, 1957

All of the following papers will be preprinted for distribution to members of the American Society for Metals upon request. The Society will print only 10% in excess of the number of orders for preprints in the office on press date, and this excess 10% will be sent out as long as it lasts. Order the papers by their numbers before Sept. 15, 1957. Preprints No. 24, 36, 44, 54 and 55 are for publication only in TRANSACTIONS, all of the other papers listed will be presented at the National Metal Congress.

The preprints listed represent the second quarterly preprinting of papers accepted by the Transactions Committee for inclusion in the annual volume of the Transactions of the Society. Notice of the first quarterly preprinting appeared in March 1957.

14. **Brittle to Ductile Transition Temperatures of Binary Chromium-Base Alloys,** by E. P. Abrahamson, II, and N. J. Grant, Department of Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

15. **Mechanical Properties and Heat Treatment of Titanium-Niobium Alloys,** by L. W. Berger, D. N. Williams and R. I. Jaffee, Battelle Memorial Institute, Columbus, Ohio.

16. **Effect of Per Cent Tempered Martensite on Endurance Limit,** by F. Borik, R. D. Chapman and W. E. Jominy, Engineering Division, Chrysler Corp., Detroit, Mich.

17. **Growth of Uranium Upon Thermal Cycling,** by J. E. Burke and A. M. Turkalo, General Electric Co., Research Laboratory, Schenectady, N. Y.

18. **Effect of Microstructure and Heat Treatment on the Mechanical Properties of AISI Type-431 Stainless Steel,** by G. E. Dieter, E. I. du Pont de Nemours & Co., Inc., Experimental Station, Wilmington, Del.

19. **Transformation Kinetics and Mechanical Properties of Zr-Ti and Zr-Sn Alloys,** by R. F. Domagala, D. W. Levinson and D. J. McPherson, Metals Research Dept., Armour Research Foundation of Illinois Institute of Technology, Chicago, Ill.

20. **Transformation Kinetics of Zirconium-Uranium Alloys,** by D. L. Douglass, L. L. Marsh and G. K. Manning, Metallurgical Engineering Division, Battelle Memorial Institute, Columbus, Ohio.

21. **Effect of Aging Cycle on the Properties of an Iron-Base Alloy Hardened With Titanium,** by T. W. Eichelberger, Metallurgy Dept., Westinghouse Electric Corp., Research Laboratories, Pittsburgh, Pa.

22. **The Occurrence of Laves-Type Phases Among Transition Elements,** by R. P. Elliott and W. Rostoker, Metals Research Dept., Armour Research Foundation of Illinois Institute of Technology, Chicago, Ill.

23. **Effects of Temperature-Time Histories on the Tensile Properties of Airframe Structural Aluminum Alloys,** by R. E. Fortney, Structures Research Section, and C. H. Avery, Metallurgical Section, Materials and Process Engineering, Northrop Aircraft, Inc., Hawthorne, Calif.

24. **Thorium-Zirconium and Thorium-Hafnium Alloy Systems,** by E. D. Gibson, B. A. Loomis and O. N. Carlson, Ames Laboratory, Iowa State College, Ames, Iowa.

25. **Transformation Structures in Hypo-Eutectoid Alloy Steels,** by W. C. Hagel and M. N. Ruoff, Metallurgy Applied Research, General Electric Co., Materials and Processes Laboratory, Schenectady, N. Y.

26. **Mechanical Properties Correlated With Transformation Characteristics of Titanium-Vanadium Alloys,** by E. L. Harmon and A. R. Troiano, Dept. of Metallurgical Engineering, Case Institute of Technology, Cleveland, Ohio, and J. Kozol, Combustion Engineering, Inc., Windsor, Conn.

27. **Effect of Rate of Stress Application and Temperature on the Upper Yield Stress of Annealed Mild Steel,** by J. A. Hendrickson and D. S. Wood, Mechanical Engineering Dept., California Institute of Technology, Pasadena, Calif.

28. **Initiation of Brittle Fracture in Mild Steel,** by J. A. Hendrickson, D. S. Wood and D. S. Clark, California Institute of Technology, Pasadena, Calif.

29. **Phase Relationships in Austenitic Cr-Mn-C-N Stainless Steels,** by C. M. Hsiao and E. J. Dulis, Research & Development Laboratory, Crucible Steel Co. of America, Pittsburgh, Pa.

30. **Powder Metallurgy of Zirconium-Uranium Alloys,** by Herbert S. Kalish, Metal Fabrication & Assembly, Sylvania Electric Products Inc., Atomic Energy Division, Bayside, N. Y.

31. **Distribution of Residual Stresses in Carburized Cases and Their Origin,** by D. P. Koistinen, General Motors Corp., Detroit, Mich.

32. **Carbide Precipitation and Brittleness in Austenitic Stainless Steel,** by A. Kramer and W. M. Baldwin, Jr., Case Institute of Technology, Cleveland, Ohio.

33. **Morphological and Phase Changes During Quench-Aging of Ferrite Containing Carbon and Nitrogen,** by G. Lagerberg, Research Dept., Stora Kopparbergs Bergslags Aktiebolag, Domnarvet, Sweden, and B. S. Lement, Research Staff, Dept. of Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

34. **Mode of Hydride Precipitation in Alpha Titanium and Alpha Titanium Alloys,** by Tien-Shih Liu, Titanium Metals Corp., Henderson, Nev., and M. A. Steinberg, Metallurgy Dept., Horizons Inc., Cleveland, Ohio.

35. **Microstructural Changes of Uranium Upon Thermal Cycling,** by L. T. Lloyd and R. M. Mayfield, Metallurgy Division, Argonne National Laboratory, Lemont, Ill.

36. **Hydrogen-Uranium Relationships,** by M. W. Mallett, Thermal Chemistry Group, and M. J. Trzeciak, Assistant Division Chief, Battelle Memorial Institute, Columbus, Ohio.

37. **Effects of Cycling Variables Upon Growth Rate of 300° C. Rolled Uranium,** by R. M. Mayfield, Metallurgy Division, Argonne National Laboratory, Lemont, Ill.

38. **Factors Affecting the Absorption and Distribution of Hydrogen in Titanium During Acid Pickling,** by C. R. McKinsey, M. Stern and R. A. Perkins, Metals Research Laboratories, Electro Metallurgical Co., Niagara Falls, N. Y.

39. **Study of the Role of Carbon in Temper Embrittlement,** by E. B. Mikus, Research Staff, General Motors Corp., Detroit, Mich., and C. A. Siebert, Dept. of Metallurgical Engineering, University of Michigan, Ann Arbor, Mich.

40. **Some Properties of Uranium-Low Titanium Alloys,** by D. J. Murphy, Dept. of Metallurgy, University of Arizona, Tucson, Ariz.

41. **Brittle Fracture of Mild Steel in Tension at −196° C.,** by W. S. Owen, B. L. Averbach and Morris Cohen, Dept. of Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

42. **Machinability of Type-A Leaded Steels,** by E. J. Paliwoda, Jones & Laughlin Steel Corp., Graham Research Laboratory, Pittsburgh, Pa.

43. **Unpredicted Grain Boundary Movement in Bicrystalline Aluminum,** by R. B. Pond and E. Harrison, Dept. of Mechanical Engineering, Johns Hopkins University, Baltimore, Md.

44. **Tensile and Stress-Rupture Properties of Chromium,** by J. W. Pugh, Refractory Metals Laboratory, General Electric Co., Lamp Wire and Phosphors Dept., Cleveland, Ohio.

45. **Evaluation of a New Titanium-Base Sheet Alloy, Ti-4Al-3Mo-1V,** by R. S. Richards, D. L. Day and H. D. Kessler, Metallurgical Research Division, Titanium Metals Corp. of America, Henderson, Nev.

46. **Some Relationships Between Torsional Strength and Electron Microstructure in a High Carbon Steel,** by S. T. Ross, Metallurgical Research, R. P. Sernka and Walter E. Jominy, Chrysler Corp., Engineering Division, Detroit, Mich.

47. **Effect of Oxide Recrystallization on the Oxidation Kinetics of a 62:38 Copper-Nickel Alloy,** by J. A. Sartell, S. Bendel, T. L. Johnston and C. H. Li, Minneapolis-Honeywell Regulator Co., Research Center, Hopkins, Minn.

48. **Mechanical Properties of Forged Chromium,** by S. A. Spachner and W. Rostoker, Armour Research Foundation of Illinois Institute of Technology, Metals Research Dept., Chicago, Ill.

49. **Relation Between Constitution and Ultimate Grain Size in Aluminum—1.25% Manganese Alloy 3003,** by Philip R. Sperry, Dept. of Metallurgical Research, Kaiser Aluminum & Chemical Corp., Spokane, Wash.

50. **Some Aspects of the Morphology and Chemistry of Lead in Leaded High-Sulphur Steels,** by J. W. Thurman, E. J. Paliwoda, Jones & Laughlin Steel Corp., Graham Research Laboratory, Pittsburgh, Pa., and E. J. Duwell, Minnesota Mining & Manufacturing Co.

51. **Influence of Nickel on Intergranular Corrosion of 18% Chromium Steels,** by J. R. Upp, Wright Air Development Center, Wright-Patterson Air Force Base, Ohio, F. H. Beck and M. G. Fontana, Dept. of Metallurgical Engineering, Ohio State University, Columbus, Ohio.

52. **Grain Boundary Self-Diffusion of Nickel,** by W. R. Upthegrove, Dept. of Metallurgical Engineering, University of Oklahoma, Norman, Okla., and M. J. Sinnott, Dept. of Chemical and Metallurgical Engineering, University of Michigan, Ann Arbor, Mich.

53. **Energy Stored in Ingot Iron Deformed by Torsion at 25° C., −82° C. and −185° C.,** by T. P. Wang, Wilbur B. Driver Co., Newark, N. J., and Norman Brown, University of Pennsylvania, School of Metallurgical Engineering, Philadelphia, Pa.

54. **Tantalum-Columbium Alloy System,** by D. E. Williams and W. H. Pechin, Institute for Atomic Research and Dept. of Chemistry, Iowa State College, Ames, Iowa.

55. **Partial Phase Diagrams of the Systems Mg-Th and Mg-Th-Zr,** by A. S. Yamamoto and W. Rostoker, Armour Research Foundation of Illinois Institute of Technology, Technology Center, Chicago, Ill.

56. **Effects of Fabrication and Heat Treatment Variables Upon the Thermal Cycling Behavior of Uranium,** by S. T. Zegler, R. M. Mayfield and M. H. Mueller, Argonne National Laboratory, Lemont, Ill.

Guests at Toledo's Old Timers Night

Shown at the Toledo Chapter's Old Timers Night Meeting Are, From Left: Donald J. Walter, Metal Progress; *H. W. Bluethe, Surface Combustion Corp.; National Secretary W. H. Eisenman; G. J. Langenderfer, Quinten Kenny and C. S. Haughey, Surface Combustion Corp.; A. P. Ford, Sales Manager,* Metal Progress; *and H. W. Schramm and F. D. Widner, Surface Combustion Corp. Mr. Eisenman spoke on the "Past and Future of A.S.M."*

CHAPTER OFFICERS, 1957-58

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
AKRON	Manuel Goldman 2419 21st St. Cuyahoga Falls, Ohio	C. L. Riggs, Jr. 84 Ernest Dr., Box 45 Tallmadge, Ohio	Robert M. Moore 1950 Tudor St. Cuyahoga Falls, Ohio	Robert L. Rowe 1045 S. High St. Akron 11, Ohio
ALBERTA	W. Cecil Rowe Crane Ltd. P.O. Box 189 Calgary, Alb.	James D. Connochie Dominion Bridge Co. R.I.E. Works Ltd. 803 24th Ave., S.E. Calgary, Alb.	A. O. Henderson 5015 1st St., N.W. Calgary, Alb.	
ALBUQUERQUE	Douglas W. Ballard 2339 Inez Dr., N.E. Albuquerque, N. Mex.	Howard E. Montgomery 614 Ridge Place, N.E. Albuquerque, N. Mex.	Donald R. Johnson 514 Maple, S.E. Albuquerque, N. Mex.	Arthur W. Porter 1618 Cornell Dr., N.E. Albuquerque, N. Mex.
ATLANTA	Richard B. Belser Georgia Institute of Technology 225 North Ave., N.W. Atlanta, Ga.	Frank A. Teeple, Jr. Atlantic Steel Co. P.O. Box 1714 Atlanta 1, Ga.	Michael F. Wiedl, Jr. Atlantic Steel Co. P.O. Box 1714 Atlanta 1, Ga.	E. L. Smith Southern Metal Treating Co. of Georgia, Inc. 1590 Huber St., N.W. Atlanta, Ga.
BALTIMORE	Selden C. Hayes Rt. 29, Columbia Pike Clarksville, Md.	William H. Redden Metallurgical Dept. Bethlehem Steel Co. Sparrows Point, Md.	John S. White 901 Fairway Dr. Towson 4, Md.	
BIRMINGHAM	Bruce M. Jones, Jr. Rt. 13, Box 530 Birmingham 9, Ala.	William C. Mayer 1467 Alford Ave. Birmingham, Ala.	Moss V. Davis 1791 Vestaview Lane Birmingham 9, Ala.	
BOSTON	William F. Collins 16 Albermarle Rd. Newtonville 60, Mass.	Richard A. Pomfret Ship Building Div. Bethlehem Steel Co. Fore River Yard Quincy, Mass.	John D. Paine, Jr. 1 Doane St. Marblehead, Mass.	
BRITISH COLUMBIA	J. W. Booth Boyles Bros. Drilling Co. Ltd. 1291 Parker St. Vancouver, B. C.	H. A. Norquay 2165 W. 10th Ave. Vancouver, B. C.	L. A. Mittan 5850 Athlone Vancouver 13, B. C.	W. J. C. Newson Steel Co. of Canada Ltd. 850 W. Hastings Vancouver 1, B. C.
BUFFALO	C. W. Hart Donner Div. Republic Steel Corp. 1175 S. Park Ave. Buffalo 20, N. Y.	John L. Lamont P.O. Box 580 Niagara Falls, N. Y.	E. M. Galbreath 198 Parkwood Ave. Kenmore 17, N. Y.	Fred A. Webber 75 Clark St. Kenmore 17, N. Y.
CALUMET	Thomas A. Foss 4123 Dearborn St. E. Chicago, Ind.	Earl K. Phares 6940 Woodmar Ave. Hammond, Ind.	William R. Barnett 231 S. Court St. Crown Point, Ind.	Louis J. Zadra General American Transportation Corp. 143rd & Railroad Aves. E. Chicago, Ind.
CANTON-MASSILLON	G. Brainard Trumble 2018 Fulton Rd., N.W. Canton, Ohio	Wilbert W. Scheel 3921 Bellwood Dr., N.W. Canton 8, Ohio	Albert J. Gusky 1247 Valleyview Ave. S.W. Canton 10, Ohio	George P. Michalos 1128 24th St., N.E. Canton 4, Ohio
CAROLINAS	R. J. Polivka 2420 Cherokee Lane Winston-Salem, N. C.	James L. Highsmith James L. Highsmith & Co. P.O. Box 1011 Charlotte 1, N. C.	W. W. Austin, Jr. Dept. of Mineral Industries N. C. State College Raleigh, N. C.	V. J. Vierling 784 Austin Lane Winston-Salem, N. C.
CEDAR RAPIDS	Richard Pugh Williamsburg, Iowa	Edwin V. Zahorik, Sr. 1529 A. Ave., N.E. Cedar Rapids, Iowa	Carol F. Shadle 846 Fifth Ave., S.E. Cedar Rapids, Iowa	

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
CHATTANOOGA	John J. Pikciunas, Jr. 828 Belvoir Ave. Chattanooga, Tenn.	LeWayne N. Wall 800 S. Moore Rd. Chattanooga 4, Tenn.	G. B. Wadsworth 911 N. Moore Rd. Chattanooga 11, Tenn.	Charles R. Pandelis 4115 Lazard St. Chattanooga, Tenn.
CHICAGO	Braly S. Myers International Harvester Co. 2626 W. 31st Blvd. Chicago 8, Ill.	William Wilson 3308 N. New England Ave. Chicago 34, Ill.	J. H. Greenberg A. J. Boynton & Co. 111 N. Wabash Ave. Chicago 2, Ill.	
CHICAGO-WESTERN	James F. Schumar 731 S. Vine Hinsdale, Ill.	Richard W. Hanzel 1011 N. La Grange Rd. La Grange Park, Ill.	Oliver S. Spark 6600 S. Nashville Chicago 38, Ill.	
CINCINNATI	Russell Hoffman Tool Steel Gear & Pinion Co. 211 Township Ave. Cincinnati 16, Ohio	Fred C. Robertshaw, Jr. 6875 Juniper View Lane Cincinnati 27, Ohio	Walter J. Koshuba 424 Hillcrest Dr. Wyoming 15, Ohio	Albert J. Pfetzing 140 Kinsey Ave. Cincinnati 19, Ohio
CLEVELAND	Charles H. Campbell 116 Wandle Ave. Bedford, Ohio	K. J. Humberstone American Tank & Fabricating Co. 12314 Elmwood Ave. N.W. Cleveland 11, Ohio	A. J. McCullough 1155 Pomona Rd. Cleveland Hgts. 12, Ohio	James P. Long, Jr. 4765 Willocroft Rd. Willoughby, Ohio
COLUMBIA	George E. Daniels 913 Woodlawn Ave. Columbia, S. C.	R. G. Waites 6211 Satchelford Rd. Columbia, S. C.	Frank Cox 822 S. Bonham Rd. Columbia, S. C.	D. W. Weber 3218 Lakewood Ave. Columbia, S. C.
COLUMBIA BASIN	Richard B. Socky General Electric Co. Bldg. 328, Rm. 221 Richland, Wash.	Walter P. Wallace 1923 Hood Richland, Wash.	Joe W. Goffard 1715 N. Meridian Pasco, Wash.	L. J. Chockie 1116 Cottonwood Richland, Wash.
COLUMBUS	Gerald K. Wood 2406 Bristol Rd. Columbus 21, Ohio	Thomas L. Chase Electric Heat Treating Co. P. O. Box 1115 Columbus 16, Ohio	R. E. Christin Electric Heat Treating Co. P. O. Box 1115 Columbus 16, Ohio	John G. Kura Battelle Memorial Institute 505 King Ave. Columbus 1, Ohio
DAYTON	William T. Bryan 10 Winding Way Dayton 9, Ohio	Walter J. Ridd 2905 Harvey Ave. Dayton 9, Ohio	David C. Heckard 1105 Ellen Dr. Middletown, Ohio	R. A. Grayson 4965 Silvercrest Terr. Dayton 10, Ohio
DELAWARE VALLEY	William F. Hipple 1808 S. Crescent Blvd. Yardley, Pa.	J. Benedict Kopec 105 Coleman Rd. Hamilton Sq., N. J.	John F. Georgiadis 1805 Wrightfield Ave. Yardley, Pa.	W. E. Johannsen King George Rd. Pennington, N. J.
DES MOINES	O. Norman Carlson 625 10th St. Ames, Iowa	Donald D. Russell 2001 34th St. Des Moines, Iowa	M. L. Patzig, Jr. Patzig Testing Labs 2215 Ingersoll Ave. Des Moines, Iowa	
DETROIT	Daniel L. Wertz 950 Whitmore Rd. Detroit 3, Mich.	Donald J. Henry 139 Northwood Rochester, Mich.	H. John Sheppard American Cyanamid Co. 10115 W. McNichols Rd. Detroit 21, Mich.	
EASTERN NEW YORK	Arthur A. Burr 983 Spring Ave. Rd. Troy, N. Y.	Jack H. Westbrook General Electric Co. Research Lab, Rm. 1816 P.O. Box 1088 Schenectady, N. Y.	William Piltman General Electric Co. 273 North Ave. Bldg. 273-259 Schenectady 5, N. Y.	Mrs. C. B. Craver Allegheny Ludlum Steel Corp. Watervliet, N. Y.

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
EDMONTON	James G. Parr University of Alberta Dept. of Metallurgy Edmonton, Alb.	Frank Fathers Premier Steel Mills Ltd. P.O. Box 348 Edmonton, Alb.	Richard E. Hardie 11622 128th St. Edmonton, Alb.	Herb Bear 9626 90th St. Edmonton, Alb.
FORT WAYNE	Andrew Van Echo Joslyn Mfg. & Supply Co. 1701 McKinley Ave. Ft. Wayne, Ind.	George R. Hemmeter 4757 Holton Ave. Ft. Wayne, Ind.	Dick W. Hemphill 3872 Plymouth Rd. Ft. Wayne, Ind.	James P. Crosbie 1911 Colonial Dr. Ft. Wayne 8, Ind.
GOLDEN GATE	Wallace J. Ericksen 107 Del Monte Ave. Los Altos, Calif.	Robert L. Ray 1040 Park Lane Oakland 10, Calif.	H. E. Krayenbuhl 6129 Buena Vista Oakland 18, Calif.	Sutherland Hutton 10 Snowberry Lane Orinda, Calif.
HARTFORD	C. J. McDonall Plainville Rd. Unionville, Conn.	W. R. Edgerton Wm. L. Barrett Co. 36 School St. Bristol, Conn.	T. P. Hanford The Stanley Works New Britain, Conn.	W. R. Yerger American Screw Co. Willimantic, Conn.
INDIANAPOLIS	George J. Shubat 328 S. 6th St. Zionsville, Ind.	Carl E. Weber Lindberg Engineering Co. 230 E. Ohio St., Rm. 217 Indianapolis 4, Ind.	Charles C. Patton 6502 E. 56th St. Indianapolis 26, Ind.	John E. Mitchell 902 N. Belmar Indianapolis 19, Ind.
INLAND EMPIRE	Thomas J. Summerson Dishman Br. N. 1106 Felts, Spokane 62, Wash.	George J. Fegan W. 2410 Rockwell Ave. Spokane, Wash.	Philip R. Sperry Kaiser Aluminum & Chemical Corp. Trentwood Br. Spokane, Wash.	
JACKSON	Charles R. St. John Industrial Steel Treating Co. 1314 W. Ganson St. Jackson 4, Mich.	James H. McKlveen 3617 McCain Rd. Jackson, Mich.	E. T. Schallhammer 4050 Seymour Rd. Jackson, Mich.	
JACKSONVILLE	Bernard W. Boisvert 7315 Poinciana Ave. Jacksonville 7, Fla.	W. T. Tiffin University of Florida Gainesville, Fla.	George Black The George Black Co. 1101 Prudential Bldg. Jacksonville 7, Fla.	S. M. Bowes, Jr. Florida Machine & Foundry Co. P.O. Box 2760 Jacksonville, Fla.
KANSAS CITY	David C. Goldberg Westinghouse Electric Corp. Gas Turbine Div. Kansas City, Mo.	Charles K. Kenyon Sheffield Steel Corp. Metallography Div. Kansas City 3, Mo.	C. Gerald Hummon Sheffield Steel Corp. Kansas City 23, Mo.	Charles R. Wilson 924 E. 77th St. Terr. Kansas City 5, Mo.
LEHIGH VALLEY	Leon J. McGeady Lafayette College Dept. of Met. Eng. Easton, Pa.	John F. Clark 1527 Kaywin Ave. Bethlehem, Pa.	Otto Ehrsam, Jr. 1614 Fairmount Bethlehem, Pa.	T. J. Reynolds 671 Hillcrest Blvd. Phillipsburg, N. J.
LONG ISLAND	Charles P. Sammis Locust Ave. E. Norwich, N. Y.	R. M. Platz Fairchild Engine Div. Materials Lab Deer Park, N. Y.	Clinton F. Zabriskie 22 Guilette Place Amityville, N. Y.	William G. Lidman 123 Thomas Powell Blvd. Farmingdale, N. Y.
LOS ALAMOS	Fred W. Schonfeld P.O. Box 1663 Los Alamos, N. M.	William W. Martin 4130A Arizona Ave. Los Alamos, N. M.	Thomas I. Jones, Jr. 3549A Arizona Ave. Los Alamos, N. M.	
LOS ANGELES	John E. Wilson 1007 Brockman Bldg. 520 W. 7th St. Los Angeles 14, Calif.	Stuart K. Oliver 1007 Brockman Bldg. 520 W. 7th St. Los Angeles 14, Calif.	Henry A. Curwen 10650 S. Alameda St. Los Angeles 54, Calif.	William V. Ward 1647 Olive Lane La Canada, Calif.

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
LOUISVILLE	F. F. Dietsch 315 Foeburn Lane Louisville 7, Ky.	Henry F. Keller, Jr. 1715 Culbertson Ave. New Albany, Ind.	J. H. Pyles 4122 Handley Ave. Louisville 18, Ky.	
MAHONING VALLEY	Russell T. Wiandt 2550 S. Meridian Rd. Youngstown, Ohio	Karl L. Fetters Youngstown Sheet & Tube Co. Stambaugh Bldg. Youngstown 1, Ohio	Albert J. Fletcher 401 N. Bentley Niles, Ohio	
MANITOBA	S. R. Channing 198 Aubrey St. Winnipeg, Man.	L. E. Windsor James B. Carter, Ltd. 85 Water St. Winnipeg, Man.	W. J. Flynn John Bertram & Sons 818 Oakenwald Ave. Winnepeg 9, Man.	N. Bickell 660 St. Matthews Ave. Winnipeg, Man.
MICHIGAN COLLEGE OF MINING & TECHNOLOGY	Lawrence D. Bandy 15511 Hartwell St. Detroit 27, Mich.	Jay Ward Schultz 218 Blanche St. Houghton, Mich.	Donald J. Fitzpatrick 218 Blanche St. Houghton, Mich.	
MILWAUKEE	Marvin Evans 2873 N. 53rd St. Milwaukee 10, Wis.	Scott L. Henry 3846 N. 37th St. Milwaukee 10, Wis.	Ernest G. Guenther 3336 N. Downer Ave. Milwaukee 11, Wis.	
MINNESOTA	Norman C. Silver 8212 Virginia Circle St. Louis Park 26, Minn.	Morris E. Nicholson University of Minnesota Institute of Technology Minneapolis 14, Minn.	Miss Lillian K. Polzin 214 Wesley Temple Bldg. Minneapolis 3, Minn.	
MONTREAL	K. W. Shaw Imperial Oxygen, Ltd. 8375 Mayrand St. Montreal 9, Que.	R. Thompson Canadian Steel Foundries, Ltd. 5227 Notre Dame St., E. Montreal, Que.	H. Neville Mason P.O. Box 371 Station "H" Montreal, Que.	William S. White 100 Easton Montreal W. 28, Que.
MUNCIE	Melvin Altmark Brewington Woods Muncie, Ind.	Robert M. Mathews 918 S. 17th St. New Castle, Ind.	Harold L. Reeves 216 S. Nichols Ave. Muncie, Ind.	
NEW HAVEN	H. O. Seeley 92 Home Acres Ave. Milford, Conn.	Kenneth L. Tingley R.F.D. #1 Thomaston, Conn.	John M. Quinn 24 General Patton Dr. Naugatuck, Conn.	Fred E. Storm Chase Brass & Copper Co., Inc. 236 Grand St. Waterbury 20, Conn.
NEW JERSEY	S. G. Lindstrom American Can Co. 320 Elizabeth Newark 8, N. J.	John L. Everhart 110 Gallows Hill Rd. Westfield, N. J.	H. F. J. Skarbek 1075 Woolley Ave. Union, N. J.	Richard W. Thorne 43 Hillside Ave. Caldwell, N. J.
NEW ORLEANS	Richard F. Brunner 2820 DeLille St. Chalmette, La.	Frederick J. Mohr 1435 Madrid St. New Orleans 22, La.	G. C. O'Neill 1910 Alexander Ave. Arabi, La.	Kirksey Garrett 109 Seventh St. Westwego, La.
NEW YORK	W. J. Kennelly, Jr. Latrobe Steel Co. 741 Ransey Ave. P.O. Box 686 Hillside, N. J.	Frank D. Malone 407 Bergen Blvd. Oradell, N. J.	A. V. Alessandria 142 Tardy Lane S. Wantagh, L. I., N. Y.	Harold Margolin New York University College of Engineering Research Div., Bldg. 1 New York 53, N. Y.
NEW YORK UNIVERSITY	Arnold Lent 114 Field Place Bronx 68, N. Y.	Martin S. Seltzer 65-85 162nd St. Flushing 65, N. Y.	Howard Hoffman 727 E. 48th St. Brooklyn 3, N. Y.	Irwin Kudman 2301 Ave. Z Brooklyn 35, N. Y.

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
NORTHERN ONTARIO	James L. Laidlaw 10 The Drive Sault Ste. Marie, Ont.	John G. Underwood 405 North St. Sault Ste. Marie, Ont.	James B. McNichol Algoma Steel Corp. Ltd. Bar & Strip Mill Lab Sault Ste. Marie, Ont.	R. H. Baber 961 Wellington St., E. Sault Ste. Marie, Ont.
NORTH TEXAS	Albert S. Holbert Continental-Emsco Co. P. O. Box 36 Garland, Tex.	C. E. Perkins Superior Heat Treating Co. Box 1686 Ft. Worth 1, Tex.	Earl L. Casey 10326 Coppedge Lane Dallas 20, Tex.	Stephen Maszy 3968 Spurgeon Ft. Worth, Tex.
NORTHEAST PENNSYLVANIA	Robert C. Williams 1722 Wyoming Ave. Scranton 9, Pa.	H. L. MacGregor 409 E. 2nd St. Berwick, Pa.	F. R. Yurkoski, Jr. Main St. Mocanaqua, Pa.	
NORTHWESTERN PENNSYLVANIA	G. E. Mohnkern Henrys Bend Star Route Oil City, Pa.	Otto Ehlers R. D. #6 Meadville, Pa.	William W. Lynch, Jr. 518 N. Second St. Titusville, Pa.	
NOTRE DAME	W. A. Leeper 2519 Benedict South Bend, Ind.	W. L. Schalliol R.R. #1 Edwardsburg, Mich.	B. D. Cullity University of Notre Dame Notre Dame, Ind.	E. A. Peretti University of Notre Dame Notre Dame, Ind.
OAK RIDGE	W. O. Harms 1415 Agawela Ave. Knoxville, Tenn.	W. S. Dritt 103 Euclid Place Oak Ridge, Tenn.	Henry Inouye 105 Newberry Circle Oak Ridge, Tenn.	E. E. Hoffman Oak Ridge National Laboratory Metallurgy Div. Oak Ridge, Tenn.
ONTARIO	R. Smallman-Tew 134 King St. Weston, Ont.	J. Howard Pope Imperial Oxygen, Ltd. 41 Mill St. Toronto, Ont.	Edward J. Payne P. O. Box 776 Grimsby, Ont.	J. E. Shirreff Johnson Matthey & Mallory Ltd. 110 Industry St. Toronto 15, Ont.
OREGON	T. B. Mathisen 505 37th St. Milwaukie 22, Ore.	Arthur H. Greisser 908 Electric Bldg. Portland 5, Ore.	W. J. Ulrich, Jr. Pacific Machinery & Tool Steel Co. 630 S. E. Belmont Portland 14, Ore.	
OTTAWA VALLEY	R. L. Cunningham 309 Fairmont Ave. Ottawa 3, Ont.	Donald A. Scott 180 Mountbatten Ottawa, Ont.	Stanley A. Agnew 39 Julian Ave. Ottawa, Ont.	
PENN STATE	Glenn W. Bush G14, Garden House Apt. E. College Ave. State College, Pa.	Gerald M. Arey Main St. Pleasant Gap, Pa.	L. F. Haller 143 Hartswick Ave. State College, Pa.	
PEORIA	J. G. Frantzreb 1209 N. Berkeley Peoria, Ill	Raymond H. Hays Caterpillar Tractor Co. Peoria, Ill.	John M. St. John 622 Fondulac Dr. E. Peoria, Ill.	
PHILADELPHIA	F. J. Whitney, Jr. Heintz Mfg. Co. Front St. & Olney Ave. Philadelphia 20, Pa.	Charles A. Turner, Jr. Cricket Rd. Flourtown, Pa.	H. N. Ghenn American Viscose Co. Marcus Hook, Pa.	George J. Kaiser Penn. Forge Corp. Milnor & Bleigh Sts. Tacony, Pa.
PHOENIX	John R. Decker 1227 E. McLellan Blvd. Phoenix, Ariz.	Ralph L. Fischer 5633 E. Cambridge Phoenix, Ariz.	G. E. McCarthy 6155 N. 17th Dr. Phoenix, Ariz.	R. F. Russi, Jr. Motorola, Inc. 5005 E. McDowell Rd. Phoenix, Ariz.

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
PITTSBURGH	Lester C. Hill 1615 Second St. Beaver, Pa.	Stewart G. Fletcher 7 Saxman Dr. Latrobe, Pa.	E. L. Weaver, Jr. Leeds & Northrup Co. 300 Mt. Lebanon Blvd. Pittsburgh 34, Pa.	Gilbert Soler Universal-Cyclops Steel Corp. Bridgeville, Pa.
PUGET SOUND	Claude B. Holder 3017 36th St., S.W. Seattle 6, Wash.	John W. Sweet 459 Newton Seattle 9, Wash.	Howard L. Southworth 7027 46th St., S.W. Seattle 16, Wash.	
PUGET SOUND-UNIVERSITY OF WASHINGTON	Richard A. Peterson 2111 E. 47th Seattle 5, Wash.	Henry Okumura 4532 18th Ave., N.E. Seattle 5, Wash.	Kenneth A. Miles 101 Campus Pkwy. Seattle 5, Wash.	
PURDUE	Leonard J. Ewalt 3002 South St. Lafayette, Ind.	Clarence T. Leaman 805 S. 19th St. Lafayette, Ind.	Edward G. Ridoux 122 Buckworth Dr. Kokomo, Ind.	
QUEBEC	Earl S. Guy 2580 Gregg St. St. Foye, Quebec, Que.	R. J. A. Potvin Dept. of Mines & Metallurgy Blvd. de l'Entente Quebec, Que.	Fernand Claisse R.R. #1 St. Sauveur de Quebec, Que.	
RHODE ISLAND	W. P. Matthew R.F.D. Wood St. Washington, R. I.	Clifford S. Ey 72 Wauregan Dr. Edgewood 5, R. I.	James J. Desonie 66 Taylor Dr. Rumford, R. I.	
ROCHESTER	Frank E. Trevett 179 Laburnium Cres. Rochester 20, N. Y.	Morton W. Finch Rochester Products Div. General Motors Corp. 1000 Lexington Ave. Rochester 3, N. Y.	H. E. Johnson 290 Sunnyside Dr. Rochester, N. Y.	
ROCKFORD	Donald A. Campbell Eclipse Fuel Eng. Co. Rockford, Ill.	Quentin C. Bowen Birch Ave. Rockford, Ill.	Richard R. Simonovich 3516 Larson Ave. Rockford, Ill.	Robert D. Werckle 1125 Railroad Ave. Rockford, Ill.
ROCKY MOUNTAIN-DENVER	J. P. Blackledge 3283 S. Holly St. Denver 10, Colo.	E. B. McPherson McPherson Corp. 1361 S. Broadway Denver 10, Colo.	N. H. Orr, Jr. Aluminum Co. of America 105 Fillmore Denver 6, Colo.	John Golding 3633 Osceola Denver 11, Colo.
ROCKY MT.-COLORADO SCHOOL OF MINES	Emmerson Kemp 60 Prospector Pk. Golden, Colo.	Bill N. Briggs 1231 S. Peoria Tulsa, Okla.	D. R. Rathburn 1120½ Washington Ave., Apt. 6 Golden, Colo.	
ROME	Harry J. Hamjian Utica Drop Forge & Tool Corp. New York Mills Plant Utica, N. Y.	Erwin O. Deimel 31 Paris Rd. New Hartford, N. Y.	John F. Mullin 911 York St. Utica 4, N. Y.	
SAGINAW VALLEY	Norman C. McClure 908 Elizabeth St. Midland, Mich.	Rufus H. Bolt 1116 N. Granger Saginaw, Mich.	Bruce E. Wright 1819 Kentucky Ave. Flint 6, Mich.	

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
ST. LOUIS	Richard D. Bardes 1032 Paul Brown Bldg. St. Louis 1, Mo.	Robert D. Leslie Crucible Steel Co. of America 8610 Page Blvd. St. Louis 14, Mo.	Robert C. Rueff 8610 Page Blvd. St. Louis 14, Mo.	Arthur H. L. Hunnius 6314 Hancock Ave. St. Louis 9, Mo.
SAN DIEGO	George D. Cremer Solar Aircraft Research Div. Pacific Highway San Diego, Calif.	Charles L. Hibert 10021 Sierra Madre Spring Valley, Calif.	F. J. Filippi 5651 Bonita Dr. San Diego 14, Calif.	C. A. Madden, Jr. 8795 Pampa St. La Mesa, Calif.
SAN FERNANDO VALLEY	Don Roda 18610 Ringling St. Tarzana, Calif.	Richard P. Frohmberg 16416 Labrador St. Granada Hills, Calif.	M. H. Binstock Atomics International P.O. Box 309 Canoga Park, Calif.	S. E. Bramer 7806 Teesdale Ave. N. Hollywood, Calif.
SANTA CLARA VALLEY	Ralph Parkman San Jose State College Dept. of Engineering San Jose, Calif.	Perry S. Slocum Ford Motor Co. P.O. Box 1101 San Jose, Calif.	H. T. Sumsion General Electric Co. 2151 S. 1st St. San Jose, Calif.	Robert A. Smith 16641 Oleander Dr. Blossom Hill Manor Los Gatos, Calif.
SAVANNAH RIVER	W. Leslie Worth 307 Banks Mill Rd. Aiken, S. C.	G. W. Beckman 131 Aldrich St. Crosland Park Aiken, S. C.	R. F. Mittelberg 524 Siskin Circle N. Augusta, S. C.	C. M. Ashton, II 717 Riverview Dr. N. Augusta, S. C.
SOUTHERN TIER	Joseph A. Rapach 215 Chapman Place Elmira, N. Y.	James C. Heymann 57 Meadowbrook Apt. Corning, N. Y.	Samuel C. Smith 264 Caldwell Ave. Elmira, N. Y.	
SPRINGFIELD	Francis D. Looney L & L Heat Treating Co. 349 Cold Spring Ave. W. Springfield, Mass.	Roger R. Heroux 85 Cooley Dr. Longmeadow 6, Mass.	Fred I. Whipple Springfield Heat Treating Corp. 99 Margaret St. Springfield 5, Mass.	
SYRACUSE	James O. Ochsner Crouse-Hinds Co. Syracuse 1, N. Y.	Henry C. Holbert 111 Austin Ave. Syracuse 7, N. Y.	E. A. March Crucible Steel Co. of America Box 977 Syracuse 1, N. Y.	T. A. Crosby Wickham Dr. Brewerton, N. Y.
TERRE HAUTE	Karl E. Fenrich 207 Woodridge Dr. Terre Haute, Ind.	R. W. Southerland 2538 Dean Ave. Terre Haute, Ind.	E. A. MacLean Rose Polytechnic Inst. Terre Haute, Ind.	Glen R. Follis Winslow Gov. Standard Scale Wks., Inc. P.O. Box 1198 Terre Haute, Ind.
TEXAS	Curtis L. Horn 4604 Cedar Oaks Lane Bellaire, Tex.	J. B. Marx Sheffield Steel Corp. P.O. Box 3129 Houston 1, Tex.	W. D. Gilder Reed Roller Bit Co. P.O. Box 2119 Houston 1, Tex.	
TOLEDO	Dean K. Seizert Ohio Fuel Gas Co. 231 Huron St. Toledo 1, Ohio	H. Dean Randolph 4339 Kingsbury Toledo, Ohio	Ray H. Myers 729 W. Carisbrook Maumee, Ohio	
TRI-CITY	Arlo G. Lundberg 2329 45th St. Rock Island, Ill.	Arnold J. Rumler 1119 18th Ave. Moline, Ill.	John E. Hatch Aluminum Co. of America Davenport Works Riverdale, Iowa	

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
TULSA	William L. Smith 4630 S. Evanston Tulsa, Okla.	M. McK. Bowman, Jr. 213 S. Elmhurst Bartlesville, Okla.	Kenneth L. Kimball 3241 S. Troost Tulsa 5, Okla.	
UTAH	E. Lewis Allen P.O. Box 18 Provo, Utah	Jack F. May Lundin & May Foundry Co. P.O. Box 369 Salt Lake City 9, Utah	C. D. Clayton 735 Northwest Orem, Utah	Robert O. Kron Western Rock Bit Mfg. Co. 552 W. 7th S. Salt Lake City, Utah
VANCOUVER ISLAND	C. F. Hopwood 237 Sims Ave. Victoria, B. C.	A. R. Alexander 2977 Foul Bay Rd. Victoria, B. C.	M. F. Gray 1098 Jasmine Ave. Victoria, B. C.	J. McPherson 120 Sims Ave. Victoria, B. C.
VIRGINIA POLYTECHNIC INSTITUTE	Joseph W. Tackett Box 5858 Va. Tech. Station Blacksburg, Va.	Dudley S. Engleby 203 Turner St. Blacksburg, Va.	Donald A. Mannas Rt. #5, Box 311-B Alexandria, Va.	James H. Steele, Jr. Box 5720 Va. Tech. Station Blacksburg, Va.
WARREN	Howard Blair American Welding & Mfg. Co. Warren, Ohio	Clark H. Weimer Copperweld Steel Co. Warren, Ohio	Tony Shields, Jr. Mallory-Sharon Titanium Corp. 980 Warren Ave. Niles, Ohio	
WASHINGTON	Henry E. Stauss 374 Washington Ave. Alexandria, Va.	John Tope Republic Steel Corp. 800 Commonwealth Bldg. Washington 6, D. C.	W. L. Holshouser, Jr. National Bureau of Standards Connecticut Ave. & Upton St. Washington 25, D. C.	W. J. Buehler 421 Kerwin Rd. Silver Spring, Md.
WEST MICHIGAN	Russell McLaughlin Kalamazoo Steel Process Co. Kalamazoo, Mich.	Warren B. Rice 2113 Maffett St. Muskegon Heights, Mich.	Richard F. Haskins 605 Brookside Dr. Allegan, Mich.	
WESTERN ONTARIO	R. J. Cyr C. H. McInnis Co. Ltd. 2500 Central Ave. Windsor, Ont.	W. A. MacIntyre E. F. Houghton & Co. of Canada, Ltd. Box 400, Byron, Ont.	H. G. Shepherd Border Tool & Die, Ltd. 2945 Walker Rd. Windsor, Ont.	W. F. Clinton 64 Springbank Dr. London, Ont.
WICHITA	Charles E. Kimball 1109 S. Inverness Wichita, Kan.	Harley E. Babst 731 W. 10th St. Wichita 2, Kan.	A. L. Paxhia 4230 E. 26th N. Wichita, Kan.	F. W. Page 3411 E. Skinner Wichita 17, Kan.
WILMINGTON	J. E. McNutt 119 Carlisle Rd. Lynnfield Wilmington, Del.	W. E. Ellis 11 Paisley Dr. Hyde Park Wilmington, Del.	J. J. Cox, Jr. 6 Pierce Rd. Deerhurst Wilmington, Del.	P. R. Chandler, Jr. 2315 Longview Dr. Coatesville, Pa.
WORCESTER	Walter J. Nartowt 6 Ann St. Holden, Mass.	Leonard L. Krasnow 31 Buckley Rd. Worcester 2, Mass.	R. N. S. Merritt, Jr. Olson Mfg. Co. 100 Prescott St. Worcester 5, Mass.	
YORK	Raymond F. Vines Dentists Supply Co. York, Pa.	E. T. Vitcha 1400 N. Cameron St. Box 171 Harrisburg, Pa.	C. R. Eppinger Horace T. Potts Co. 53 N. Duke St. York, Pa.	P. D. Strubhar R.C.A. Victor Div. Lancaster, Pa.

Jackson Welcomes New Officers

At the Annual Meeting Held by the Jackson Chapter, the Ladies Were Entertained and New Officers Installed. The Chapter, but one year old, had in its organization hoped to satisfy the needs and nurture the growth of the communities of Lansing, East Lansing, Charlotte, Battle Creek, Marshall, Albion, Hillsdale, Hudson, Adrian, Chelsea, Jackson and intervening smaller towns and hamlets in Michigan. That it has achieved this aim is evidenced by the fact that it had gained the highest percentage of new members of all chapters as of Apr. 1. Shown are, from left: Charles R. St. John, chairman; E. T. Schallhammer, secretary-treasurer; James McKlveen, vice-chairman; and John A. Richter, the outgoing chairman. (Reported by John A. Richter for Jackson Chapter)

Presents Talk on Super-High-Strength Structural Steels at Philadelphia

Speaker: A. E. Nehrenberg
Crucible Steel Co. of America

At the recent meeting of the **Philadelphia Chapter**, A. E. Nehrenberg, supervisor, research and development laboratory, Crucible Steel Co. of America, spoke on "Super-High-Strength Structural Steels".

Prior to 1945 aircraft designers were fearful of using steels such as 4340 heat treated to tensile strength levels in excess of about 180,000 psi. because it was thought that the steel might be dangerously brittle at the higher strength levels. Data by Patton, published in *Metal Progress* in May 1943, showed that the notch impact value of all alloy steels included in his survey would decrease from about 35 ft-lb. to about 15 ft-lb. when the tensile strength is increased from 180,000 to 210,000 psi.

The first super-high-strength structural steel, known as HY-Tuf, was developed by Crucible Steel Co. of America in response to a request by one of the aircraft manufacturers for a steel which would have the same Izod impact value at a tensile strength level of 230,000 psi. as SAE 4340 at 180,000 psi. tensile strength (i.e., and Izod value of about 35 ft-lb.)

The consideration which led to this development were reviewed. In brief, it was established that to obtain the maximum notch toughness at a given high level of tensile strength it is necessary to adhere to three basic principles. In the first place, the hardenability must be such that a completely martensitic structure is obtained during the hardening operation. Secondly, the carbon content must be no higher than that required to attain the required strength level after a temper at a low temperature. In the third place, the tempering temperature employed should be that corresponding with the peak in the impact resistance versus tempering temperature curve. For steels of normal silicon content this peak occurs at 400° F. When 1.5% silicon is present, this peak occurs at 550° F. The presence of this amount of silicon seems desirable in order that higher tempering temperatures can be employed without encountering "500° F. embrittlement".

These same principles were later employed in the development of steels capable of developing tensile strengths up to 300,000 psi. It has been customary in the past to obtain varying strength levels by varying the tempering temperature. It is now considered better practice to employ a fixed tempering temperature corresponding with that for the peak in the notch impact versus tempering temperature curve (550° F. for steels containing 1.5% silicon) and obtain the various strength levels by varying the carbon content. A steel for the 260,000 to 280,000 psi. tensile strength range should have a carbon content in the range 0.32 to 0.37%. For the 280,000 to 300,000 psi. tensile strength range the carbon content should be 0.38 to 0.43%.

The super-high-strength structural steels containing high silicon have been found to be less susceptible to hydrogen embrittlement than low silicon steels. Also, steels tempered in the region of "500° F. embrittlement" are more susceptible to hydrogen embrittlement than the same steel tempered at higher or lower temperatures.

New aircraft now being designed will require a super-high-strength steel which will retain much of its strength at the elevated temperatures which result from aerodynamic heating. Steels in the "hot work" family of toolsteels are currently being evaluated for this type of service. Current research is concerned with the development of a steel possessing the optimum combination of properties at elevated temperatures. Considerable progress has been made and it is likely that improved steels designed specifically for this application will soon be available commercially.—**Reported by H. A. Foy for Philadelphia Chapter.**

—MASTERING METALS FOR MANKIND—

Compliments

To RAYMOND A. QUADT, on being named director of research and development by Bridgeport Brass Co. Mr. Quadt will continue as vice-president of research and development of the Hunter Douglas Aluminum Corp., Riverside, Calif., which was acquired last year by Bridgeport.

♦ ♦ ♦

To ALFRED W. SIKES, on being awarded an Honorary Membership in the Construction Specifications Institute, in recognition of his efforts in founding the Chicago Chapter C.S.I. and in furthering the aims of the Institute nationally. Col. Sikes is a past chairman of the Chicago Chapter A.S.M.

♦ ♦ ♦

To J. HERBERT HOLLOMON, manager of metallurgy and ceramics research department, General Electric Research Laboratory, and nominee for national trustee A.S.M., on his appointment as chairman of one of three new committees established by the National Academy of Sciences Materials Advisory Board to take a long-range look at Air Force materials problems.

Panel at Canton-Massillon Discusses Vacuum Melting

A group of 175 members and guests attended a meeting of the **Canton - Massillon Chapter** to hear six panelists discuss "Vacuum Melting and Resulting Materials". The panel consisted of the following members: G. Mohling, chief metallurgist, Allegheny Ludlum Steel Corp.; A. E. Franks, division superintendent, Vacuum Metals Corp.; C. Evans, Jr., vice-president, technology and development, Universal Cyclops Steel Corp.; J. Huntington, assistant general manager, Metals Division, Utica Drop Forge & Tool Corp.; J. Ham, research associate, National Research Corp.; and R. K. McKechnie, manager, process laboratories, metallurgy and ceramics, Research Department, General Electric Co. J. A. Rinebolt, metallurgical engineer, Republic Steel Corp., acted as moderator. Prior to the general discussion, each panelist spoke briefly about a specific type or phase of vacuum melting.

Dr. Mohling discussed consumable melting. He emphasized the need of a good parent heat from which to forge the consumable electrodes. Because of the low vapor pressures of many of the deoxidation products, etc., even this closed system of melting is only partially effective in their reduction. Their distribution, however, is affected so that inclusion stringers are well dispersed, thus minimizing detrimental effects.

Mr. Franks spoke of vacuum induction melting. Furnaces up to 3000-lb. capacity are in operation. This system, which operates at 1 to 10 micron pressure, is the most flexible and exhibits good reproducibility. Oxide inclusions are reduced by adding carbon within the closed system. Consumable melted metal using a vacuum induction melted parent heat would result in the ultimate in superior products.

Mr. Evans outlined vacuum degassing. This process involves the placement of ingot molds in vacuum chambers in which steel can be poured from production ladles. This system employs aluminum seals between the ladle and the mold. As the molten stream falls into the mold, it is, because of the vacuum, broken up into droplets which readily lose their hydrogen. Degassing is often used in conjunction with large alloy steel castings. The hydrogen content is reduced, thereby eliminating the opportunity for flaking to occur during the manufacture of large forgings.

Mr. Huntington discussed superalloys. He spoke of the advantages of vacuum induction melting because such additions as aluminum and titanium can be made, perhaps as precipitation hardening agents, without the danger of oxidation, which makes very fine control possible.

Mr. Ham described some of the equipment used in the above processes. He discussed the relationship between the partial pressures of substances, such as deoxidation products, and vacuum melting reactions.

Mr. McKechnie outlined vacuum melting from the consumers viewpoint. The consumers viewpoint must be general. The increased price of vacuum melted materials is often offset for special applications by the superior mechanical and working properties of these products. In addition, as in the case of vacuum degassing, the degassing operations are often less expensive than the elaborate heat treatments that would be necessary to prevent flaking if hydrogen had not been reduced.

The subsequent panel discussion was very active. All phases and many particulars of the various processes were discussed, including interesting future applications of vacuum melting. — **Reported by John E. Fogarty for Canton-Massillon.**

Akron Hears Talk on Nuclear Reactors

William D. Manly, Associate Director, Metallurgy Division, Oak Ridge National Laboratory, Presented a Talk Entitled "A Metallurgist Builds a Nuclear Reactor" at a Meeting Held by Akron Chapter. An exceptionally large turnout of members and guests attended the meeting. Shown are, from left: Russel V. Heath, technician chairman; Dr. Manly; and Arthur E. Marble, chairman. (Reported by M. Goldman for Akron Chapter)

OBITUARIES

FRED DAHLE, department consultant at Battelle Memorial Institute, died suddenly early in May. He was a member of Columbus Chapter.

♦ ♦ ♦

STANLEY W. OTTO, Huron Forge and Machine Co., died on July 5. He had been with the company for the last 21 years, most recently as production manager. Mr. Otto was a member of the Detroit Chapter.

♦ ♦ ♦

GENE E. SWOPE, plant engineer of Axelson Manufacturing Co., died in St. Louis early in July. He was a member of the executive committee of the St. Louis Chapter and chairman of the subcommittee of attendance and reception.

♦ ♦ ♦

NOAH A. KAHN, head metallurgist, New York Naval Shipyard, suffered a fatal heart attack in June while attending a technical society convention in Atlantic City. He was a New York Chapter member.

♦ ♦ ♦

CONRAD F. NAGEL, JR., retired vice-president of Aluminum Co. of America, died July 5 at his home in Pittsburgh following a long illness. He had retired Jan. 1 after more than 41 years service with Alcoa.

A native of New York and a graduate of Cornell University where he received his degree in chemistry, Mr. Nagel joined Alcoa in 1915. He entered military service in 1917, serving two years in the infantry, part of the time in France. He returned to Alcoa in 1919 and was put in charge of the process and products division of the Technical Direction Bureau. Later he was made assistant technical director, and, in 1928, was named head of the fabricating division's newly formed metallurgical department. He became chief metallurgist in 1944 and was elected a vice-president in 1952.

One of Mr. Nagel's outstanding accomplishments was that of establishing aluminum as a major material for aircraft by determining and eradicating causes of excessive corrosion which threatened the metal's future in that field in the early 20's. He was a member of Pittsburgh Chapter.

Given Silver Certificate in Boston

Harold D. Stuck (Left), Chairman of Boston Chapter, Is Shown Presenting a Silver Certificate to W. E. Nichols, Reece Corp., for 25 Years of Continuous Membership, During a Recent Meeting Held by the Chapter

Science Achievement Award Winners Selected On Geographic Basis

The titles of the projects listed below—a mere handful from the hundreds that were submitted—give a clue to the variety and scope of the entries this year in the program of Science Achievement Awards for Students. Sponsored by the American Society for Metals and conducted by the Future Scientists of America Foundation of the National Science Teachers Association, this was the sixth annual program and it hit a record high in student participation.

A total of 2941 entries was received from students throughout the United States and Canada. As specified by the pattern of the program, the entries were submitted to judges in eight geographic regions in the United States. In each region, 15 entries were selected as winners: five 7th and 8th grade students received $25 U.S. Savings Bonds; five 9th and 10th grade students received $50 U.S. Savings Bonds; and five 11th and 12th grade students received $75 U.S. Savings Bonds.

In addition to these 120 regional winners, 20 students received National Metals Awards for projects dealing with metals and metallurgy. These awards were $100 U.S. Savings Bonds to each winner. The metals and metallurgy projects were judged on a national basis after having been considered for regional awards.

All of the winners of bonds also won FSA gold lapel pins and FSA certificates. Their schools received trophy case plaques engraved with the names of the winning students.

Honorable mention certificates were awarded to 1186 entrants. As in previous years, the regional judges found that more than 40% of the student entries merited Honorable Mention certificates.

Guidance in planning and effectively carrying out the program along the lines desired by teachers and scientists was given by an Advisory Committee. Its members were: Glenn O. Blough, associate professor of education, University of Maryland, College Park, and NSTA president-elect; Mrs. Anita Bickford, Leland Junior High School, Chevy Chase, Md.; N. C. Fick, Office of Defense Mobilization, Washington, D.C.; Edward M. North, Washington and Lee High School, Arlington, Va.; and Madeleine T. Skirven, Eastern High School, Baltimore, Md.

As a stimulant to the development of future scientists, the SAA program continues to prove most effective. For its support of the program, the American Society for Metals is due the thanks of students, scientists, industry and science teachers.

The following list includes the names of students who won National Metals Awards. The student's name is followed by grade, project title and school. Complete list, including students who won Honorable Mention, is available at the NSTA office, 1201 Sixteenth St. N. W., Washington, D.C.

Gary Bronstein (12): Metallurgy of Silicon by Displacement From Fluorides and Alumno-Thermic Reduction; Staunton Community H.S., Ill.

Bette Davis (9): Prevention of Corrosion of Metals; Macfarland Jr. H.S., Washington, D.C.

Brian Dohne (12): Electroplating; Anacostia H.S., Washington, D.C.

Murray Engle (12): A Metallurgical Study and Examination of Carbon Steel; Central H.S., Tulsa, Okla.

Richard Fantazier (11): Titanium for Tomorrow; St. Thomas H.S., Braddock, Pa.

Lionel Fraser (8): Low Melting Alloys and Their Conductivity of Electricity; Jackson College Laboratory School, Miss.

Eileen Greyson (12): Lead Reduction by Three Methods; Notre Dame H.S., Moylan-Rose Valley, Pa.

Orwic Johnson (12): Industrial Copper-Plating in Miniature; Columbus Sr. H.S., Ind.

Steve Kahler (12): Uranium Electrolysis; Westerville H.S., Ohio.

Louise Meier (10): Determination of the Coefficient of Linear Expansion of Various Metals; Hunter College H.S., New York, N.Y.

Donald Melino (11): Thermo-Electricity; La Salle Academy, Providence, R.I.

Jane Pycraft (12): Further Research on Unsolderable Materials; Lorain H.S., Ohio.

Steven Radlein (11): Electrolysis of Photographic Fixer; Red Bank H.S., Chattanooga, Tenn.

Larry Reed (12): Preparing Nickel Oxide Coating by Sputtering; Alexander Ramsey H.S., St. Paul, Minn.

John D. Reichert (12): Development of Techniques in Inorganic Analysis Using Chromatography and Electrography; S. F. Austin H.S., Austin, Tex.

Louanna Sciubba (12): Chrystalline Structure of Metals; Notre Dame H.S., Moylan-Rose Valley, Pa.

Jerry Skloss (12): Separation of Sodium Chloride by Electrolysis; St. Gerard H.S., San Antonio, Tex.

Thomas Stevens (9): Electrographic Analysis of Metals; Macfarland Jr. H.S., Washington, D.C.

Nancy Tobey (8): Specific Gravity of Metals by Archimedes Principle; Hunter College Jr. H.S., New York, N.Y.

Annika Toffer (8): Analyzing Minerals; Central Jr. H.S., Allentown, Pa.

New Films

The Big Difference

A 16 mm. sound and color film shows the difference between an ordinary casting or weldment and a modern casting engineered by the product development engineering department of Superior Steel & Malleable Castings Co., Benton Harbor, Mich. The film traces the typical case history development of a Superior engineered casting. The movie, which runs for 16 min., can be ordered directly from the company.

Progress in Metallurgical Education

Prepared by W. Morrison
A.S.M. Staff

An important fact to consider in this report is that more students are preparing for engineering careers this year than in any year since 1948. Figures compiled by the U. S. Office of Education show a total of nearly 243,000 students now studying at accredited engineering colleges. This total is almost equal to the all-time high of 1947 when the colleges were jammed with World War II veterans. The trend is still upward.

Metallurgy as an engineering study has steadily maintained its ratio in the engineering curricula, up until this year. The previous metallurgy enrollment ratio was approximately 4%. Today that ratio is nearly 5%. In other words, we have enrolled in our engineering schools approximately 1000 metallurgy students. Important to consider at this point is—how many of these 1000 metallurgy students will graduate in that engineering field? We know that the attrition in engineering enrollment is substantial. According to statistics, less than one-half of the enrolled candidates for degrees actually receive those degrees. A total of 600 degrees in metallurgy was expected in June 1957. In 1956 the total degrees in metallurgy were slightly under 500.

The point is not that we have licked the problem of trained metallurgists, but rather that the situation has improved and shows signs of continued increase. If we continue our present influence as promoters of interest in engineering, particularly metallurgical engineering, we can justify a hope that the need for metallurgists and the supply coming out of our colleges will gradually come near to a balance.

Two factors resist any simple solution to the shortage of trained metallurgists. First, our population is increasing at a fast rate, which means greater consumption of products. Second, there is a greater diversification of needs and desires, and thus a greater demand for new developments in greater volume.

Upon what do we base our confidence for a greater supply of trained metallurgists?

The whole question must be resolved by an increase of youngsters who have an interest in science and engineering, and who are properly initiated into the fundamentals of these study fields. This means an early application and study of the languages of science and engineering — mathematics, chemistry and physics. It is because of an improved outlook on this point that we base our hope and confidence.

In 1900 there were six million youngsters between the ages of 14 and 17, and 500,000 of these youngsters were enrolled in high school. Today there are nine million between the ages of 14 and 17, and nearly six million of this number are in high school.

While mathematics is generally accepted as a required study in high school, neither chemistry nor physics is considered a required subject. Only 4.6% of the high-school students enrolled actually take physics. The enrollment in chemistry is 7.5%. The important point here is that we have greatly increased our enrollment in high schools, so that the percentage represents 303,000 students enrolled in physics and 490,000 students enrolled in chemistry.

While the population of American youth between 14 and 17 increased only 50% in 57 years, the percent enrolled in high school increased 1200%. A 200% increase has been recorded in the actual enrollment of students in physics since 1900, and the enrollment in chemistry has increased 1100%.

There are a number of national programs which attest to the fact that American youth is becoming more science conscious all the time.

Maintaining and re-creating an action program to stimulate the interest of youth in science, the Future Scientists of America, with the sponsorship of A.S.M., reaches 35,000 high-school science teachers who instruct close to four million students. Each of these students is exposed to the facts about science and engineering. Never before has there been an organized program which reaches out to practically all students who could be considered for careers in science and engineering. The conclusion must be: if there is a spark of interest, if there is latent talent, if there is determination, then this program can do nothing less than encourage further study and further plans.

Closely allied to this effort by A.S.M. and F.S.A. is the continuing program by A.S.M. in the field of career information. During the school year an average of 1000 booklets (95-page "Your Career in the Metallurgical Profession") is mailed out on request from high-school science teachers all over the country. These booklets are designed to provide the teacher with proper background material as a counselor. For the students themselves quantity distribution is made of a leaflet which describes metallurgy, tells what a metallurgist does, where he works, advantages as a career, and finally, where the high-school student may study metallurgy as a profession.

All of these influences have their effect. High-school students who ordinarily would not consider metallurgy are told how it works and why it is important. We feel confident that all of these efforts bear fruit. Enrollment in our engineering schools and the number who receive degrees in metallurgy represent statistics directly related to decisions made in high school.

Actually there is but one way to increase the degree holders in metallurgy. The decision to study this engineering subject must be made in high school and the proper preparation carried out before college enrollment. The colleges can graduate only the number of metallurgists that are sent to them from high school.

Encouraging signs are many. There is an increased concern for science in elementary schools. This concern has naturally sifted down to the student body. Enrollment in science studies is the largest ever reported. There are many able and devoted teachers, although the shortage of teachers is still a serious problem in education. A hopeful sign is recorded in the many established summer institutes for science teachers throughout the country.

Impediments to progress in science and engineering education include too few qualified science teachers, lack of incentives to inspire teachers, a too-heavy teaching load, inadequate material and facilities, and too little time for science teachers for planning and student guidance.

—WORLD IMPROVEMENT WITH METALS—

Indianapolis Members Tour Industrial Heating Plant

Sixty members of the **Indianapolis Chapter** made a plant tour of the industrial heating plant of General Electric Co., Shelbyville, Ind., which consolidates all the industrial heating manufacturing facilities of the company. This plant produces industrial furnaces, induction heat treat equipment and heaters and devices.

One of the most interesting features to the visitors was the floor-level conveyor system designed to accommodate furnaces weighing up to 60 tons. Another feature was the continuous operation for making the tube steel used in the construction of tubular heaters.

The visitors also visited the well-equipped and staffed laboratory for product research, improvement of standard products, metallurgical analysis and process research. — **Reported by Dorothy Holbrook for Indianapolis.**

Presents President's Medal at Hartford

National Secretary W. H. Eisenman (Right) Is Shown as He Presented Frank P. Gilligan, Second National President of the Society, With a Past-President's Gold Medal During a Meeting Held by the Hartford Chapter. Mr. Gilligan is secretary-treasurer of the Henry Souther Engineering Co. By action of the Board of Trustees it was decided that all past presidents of the Society should be given a medal and certificate indicating that they have served the membership well and faithfully and Mr. Gilligan was president before this board action. At this same meeting Ed Bartholomew, Hartford chairman, announced that the Chapter had awarded $50 and $25 savings bonds in the Senior Division and $25 in the Junior Division of the Northern Connecticut Science Fair for exhibits in the field of metallurgy. He also announced that Hartford Chapter has shown an 8.8% increase in membership over last year and now has 358 members. National President Donald S. Clark, presented the technical talk on "Dynamic Testing of Metals". (Photo by James Lee)

Report From Rochester's Educational Committee

After a thorough investigation of community educational needs by the officers and executive committee, the **Rochester Chapter** is offering a $500 scholarship to a University of Rochester student who will complete his junior year in engineering and who is majoring in metallurgy. It is felt that this is a major step in the encouragement of the study of metallurgy and something that we may all be proud of. It is hoped that this scholarship may be expanded in the future to cover more of the fine educational institutions in the Chapter's area.

Another innovation in A.S.M. public service was produced under the guidance of Chairman Finsterwalder and the newly created student affairs committee headed by Gil Cox. A meeting of the executive committee and 40 area high-school science teachers and guidance directors was held. The meeting enabled A.S.M.'ers to hear at first hand teachers' comments on our past and proposed efforts to help them in many forms of vocational guidance. It is early to assess the true value of the meeting; however, we feel that future work with the schools will be on a much firmer foundation.

The second year of the Chapter's three-year educational course proved to be even more successful than was the first. The course, taught by John Hoffer, was based on the text "Basic Metallurgy", but included a great many movies on the processing of metals as well. At the Educational Night Dinner, Gil Cox handed out 107 diplomas. Prospects for the next year's course are, needless to say, bright.—**Reported by Jim Brown for Rochester.**

Awarded Scholarship

Gerald Meier, a senior at Technical High School, is the first Flint, Mich., student to win the engineering scholarship given by the Saginaw Valley Chapter. Gerald will begin studies at the General Motors Institute this fall, majoring in mechanical engineering.

MEN OF METAL

A. R. SCHNELLER, formerly eastern regional sales manager, has been named sales manager for the welding products division of the A. O. Smith Corp. D. H. BUERKEL, sales representative in the Philadelphia area, will succeed Mr. Schneller as eastern regional sales manager.

H. E. P. BARTA has been appointed manager of project engineering, sales division, for Pfaudler Co.

Lindberg Engineering Co. announces the appointment of H. E. POLLARD to chief engineer of the Lindberg-Fisher Division, manufacturers of nonferrous metal melting furnaces and aluminum pumping units.

Three new executive appointments have been announced by Progressive Welder Sales Co., Detroit. GEORGE W. ENK, who has been general sales manager, will join the field organization to concentrate on one of the company's major accounts, L. F. VAN NORTWICK will become general sales manager and IRVING L. POND is to be sales manager of the Frostrode Division.

L. C. COLLERAN has been appointed sales manager and W. P. COOPER, JR., assistant sales manager by the Roll Formed Products Co., at the sales offices in Youngstown, Ohio.

Because of rapid industrial development in Florida, Fansteel Metallurgical Corp. announces the appointment of W. BEN WIMBERLY, of W. Ben Wimberly Co., as its agent for the state of Florida, to sell and service their products from Clearwater.

H. RUSH SPEDDEN, in charge of the minerals research department since 1952, has been appointed director of research of Union Carbide Ore Co. He will be responsible for operations in the Union Carbide's Nuclear Research Center in Sterling Forest, N. Y., plans for which were announced recently.

R. W. RUDDLE, associated with Foundry Services, Ltd., Birmingham, England, has been appointed technical manager for Foundry Services, Inc., to be in charge of all research and development carried out in Foundry Service's laboratories in Columbus, Ohio.

Allied Research Products, Inc., Baltimore, announces the appointment of JULES HORELICK as staff executive assistant to the president, to be responsible for market research in connection with the new and extensive program of product expansion and development. He has been with the company since its inception in 1947.

MEN OF METAL

G. O. HOGLUND, head of the joining section at Aluminum Co. of America's process development laboratories, has been elected first vice-president by the American Welding Society for a one-year term.

JOHN G. HIXSON, staff assistant to director of engineering, is to be manager of technical services for the Rochester Division of Consolidated Electrodynamics Corp. He joined the company in 1952 as a physicist.

BERTRAM A. KLINE, sales manager of steel castings and miscellaneous machinery division, and general advertising manager, has been elected assistant vice-president and sales manager for Birdsboro Steel Foundry & Machine Co. He has been with the company in a sales capacity for more than 30 years.

WILLIAM D. JONES has been appointed manager of industrial relations for the Toronto, Ohio, plant of Titanium Metals Corp. of America, which is now being reconstructed as a specialized facility for forging alloy titanium billets and to roll large-size, high-strength alloy titanium sheet. He was formerly with National Lead Co. of Ohio in a similar capacity.

ROBERT L. WELLS moves from executive assistant to the vice-president, Westinghouse Electric Corp.'s aviation gas turbine division, Kansas City, Mo., to manager of the company's atomic power department in Pittsburgh.

ALAN MOYER, with Reynolds Metals Co. since 1945, has been promoted to divisional sales manager, industrial sales, Milwaukee.

Metal & Thermit Corp. has appointed R. A. STEWART sales engineer to serve electroplating accounts in northern and western Indiana, with headquarters in East Chicago.

Solar Steel Corp. has appointed ARTHUR W. MILLER, sales representative in the Columbus, Ohio, area for the past five years, as southeastern sales manager for the area served by the Nashville plant.

WILLIAM B. SUMMERS has been transferred from Carborundum Co.'s coated abrasive sales office on the Pacific Coast to the Cleveland-Pittsburgh district as sales manager.

E. A. EDWARDS is now field representative for Chromalloy Corp., covering Washington, Oregon and California, with headquarters in Seattle.

GEORGE H. WILLIAMSON has been elected vice-president in charge of West Coast activities by American Chemical Paint Co.

Future Scientist Receives $100 Award

The Photograph Records a High Degree of Satisfaction in the Smile of Richard Frantazier, 11th Grade Student at St. Thomas High School in Braddock, Pa., as He Accepts a $100 U. S. Bond From Harry Paxton, Chairman, Student Affairs Committee, Pittsburgh Chapter. Dick was one of 20 winners in the A.S.M. sponsored Science Achievement Awards program. Sister Ignatia Marie, O.P., sponsor of Dick's project, said the following about the program: "I would like the A.S.M. to know how much good has been done by this presentation. Students have been given impetus and several have started on projects for next year. Such an award is a great help in making the work of a teacher a real pleasure

Vacuum Metal Metallurgy Subject at Indianapolis

Speaker: A. M. Aksoy

Crucible Steel Co. of America

"The Metallurgy of Vacuum Metals" was the title of a talk presented by A. M. Aksoy, chief metallurgist, Vacuum Metals Division, Crucible Steel Co. of America, at a meeting held recently in **Indianapolis.**

Vacuum melting is not a new process, but it has come into use only since World War II. The rigid requirements of the aircraft and electronics industries in their demand for steels of higher alloy content to be used at elevated temperatures and for cleaner steels caused new melting techniques to be explored.

Of the several vacuum melting processes, the three most in use are vacuum degassing, vacuum arc remelting and vacuum induction.

The major advantages of vacuum induction melting are lower gas content, lower inclusion content, closer control of composition and the fact that larger amounts of reactive metals can be used as alloying agents. Thus, alloys can be melted that could not be by conventional methods.

Properties which are improved by vacuum induction melting include cleanliness, fatigue life, impact strength, ductility (particularly in transverse direction), stress-rupture life and ductility, and hot workability.

Mr. Aksoy supplemented his talk with diagrams and photographs.—**Reported by Dorothy Holbrook for Indianapolis Chapter.**

Albuquerque Features Talk On Nuclear Fuel Materials

Speaker: J. H. Frye, Jr.

Oak Ridge National Laboratory

J. H. Frye, Jr., director of the metallurgy division, Oak Ridge National Laboratory, presented a talk entitled "Economic Atomic Power Depends Upon the Materials of Construction" at a meeting held by the **Albuquerque Chapter.**

In discussing the relative costs of power generation systems in the United States, Dr. Frye pointed out that power generation by coal as compared to nuclear means was approximately in a ratio of 1:2. In countries such as England where coal is both scarce and expensive, this ratio was more or less evened up. This fact is responsible for England's lead over the United States in power generation by nuclear means.

Dr. Frye showed slides of and discussed a simple solid fuel element that could be used in a power generating system. The general method of fabricating the fuel element was discussed and illustrated. He also pointed out the economic advantages of using homogeneous liquid fuel reactors over solid fuel reactors.—**Reported by C. E. Arthur for Albuquerque.**

Presents Talk at Pittsburgh Night

Shown During the Presentation of the Annual Pittsburgh Night Citation to M. J. Day, Crucible Steel Co. of America, Are, From Left: B. R. Queneau, U. S. Steel Corp.; Dr. Day, Who Gave a Talk Entitled "Feedback in Scientific Creativity"; and L. C. Hill, 1957-58 Chairman, Pittsburgh

Speaker: M. J. Day

Crucible Steel Co. of America

On the occasion of the Sixth Annual Pittsburgh Night, the **Pittsburgh Chapter** was addressed by M. J. Day, vice-president and director of Research, Crucible Steel Co. of America. Each year the May meeting is set aside to honor a metallurgist from the Pittsburgh district who has achieved an administrative position and is still under the age of 45. Dr. Day chose as his subject "Feedback in Scientific Creativity".

Dr. Day noted in his address that, with all fields of science becoming more complex, specialization in various segments of the sciences has become commonplace. But he added that today's scientist and engineer, by his own progress, leaves himself open to the charge that he has become narrow of view.

While denying the charge, Dr. Day expressed concern with the possibility that men of science will be unable to meet the demands placed upon them unless they pause to review and chart their future purposes and responsibilities. He emphasized the need for "rounded" scientists with training or interest in the humanities, economics and social sciences.

Citing the many advances of modern civilization, Dr. Day asserted that it is not enough for the scientist or engineer to have helped to create our way of life. He must also be interested in all aspects of what he has helped to create.

Dr. Day distinguished between invention and innovation. Invention alone is creativity, he said, while innovation is the "feedback" which leads to further inventiveness and progress. It is not enough for the scientist to be mechanically creative. He must concentrate on creativity—be deliberate, organized and equipped to create — and recognize the very great necessity for creativity.

The progress of mankind, Dr. Day recalled, has been based largely upon a series of inventions or discoveries attributable to a comparative handful of men who were unbound by preconceived ideas. The day of the individual discoverer or inventor is now largely past, he noted, partially as a result of specialization and partially as a result of the greater scope and complexity of today's problems. This, he said, points up the great need for universal creative thinking.

In order to properly achieve his goals, Dr. Day said, the scientific man must renew his pledge to question the "whys" of his existence and purpose. He must debate with himself the value of his contributions to mankind, and thereby seek the feedback in creativity.

Dr. Day agreed that the cost of creative thinking sometimes is great. The creative thinker must be prepared to be scoffed at. He must be willing to accept more responsibility than his noncreative associates. He must not lose confidence in himself.

But if the cost is great, Dr. Day asserted, the reward to the truly creative scientist and engineer is greater. For in leading the way to greater fulfillment of his true purpose, the creative scientist serves his profession, his industry, his country —and not least of all, himself.—**Reported by J. A. Cameron for Pittsburgh Chapter.**

Speaks on Life Testing at Calumet

Francis G. Tatnall, Vice-President and General Manager, Tatnall Measuring Systems Co., Spoke on "Fatigue and Life Testing" at the Annual Meeting Held by Calumet Chapter. At right is vice-chairman T. A. Foss. At this meeting, A.S.M.-Pallotto scholarship awards were presented to three graduating seniors from the Calumet area who intend to follow engineering careers. They were J. W. Kruger, Crown Point High School, N. L. Broome, Gary Roosevelt High School, and A. G. Smith, Chicago Bowen High School. Representatives from the schools accompanied the winners

Outlines Production Planning Steps in an Integrated Steel Plant

Speaker: A. E. Lawrence
U. S. Steel Corp.

A. E. Lawrence, assistant superintendent—production planning, Geneva Works, Columbia-Geneva Steel Division of U. S. Steel Corp., presented a talk entitled "Production Planning for an Integrated Steel Plant" at a recent meeting in **Utah.**

Mr. Lawrence covered the part that production planning plays in modern manufacturing techniques for an integrated steel plant which largely consist of three main phases: planning of production; supplying of materials; and controlling of production, quality, service and processes.

Mr. Lawrence illustrated how the production planning organization assists in the accomplishment of these basic aspects of steelmaking and how it contributes to the success of the company by assuring more positive delivery dates—an important part of satisfying and keeping customers; by bringing about better control of inventories—a contribution to effective use of materials and money; and by contributing to lower costs—an added insurance to job security and the maintenance of an adequate profit return.

The speaker then explained a rather simple chart of the over-all steelmaking process and production flow in an integrated steel plant, showing how, in the process, perfect coordination of material flow, identification and sequence through all of the individual production processes and inventory points is essential to optimum finishing mill scheduling, good shipping practice and the maintaining of customer commitments. Proper finishing mill scheduling is one of the key points in the production pattern and sequencing of all the operations. Coordination between finishing mill and shipping schedules must be maintained through all of the preceding units so that constant changes are not required back through all phases of production, unusable or slow-moving inventories are not accumulated between processes and customer delivery commitments are maintained.

He then reviewed the key producing facilities (coke plant, blast furnaces, openhearth and rolling mills) and gave a picture tour of the key operations and facilities of the Utah Operations of the Columbia-Geneva Division. This included a picture trip to the coal mines at Price, Utah, the iron ore mines at Cedar City, Utah, the Keigley quarry, the Ironton plant and the Geneva works.

A description of the background, the purpose, the organization, the function and the activity of the production planning department was then given, including a description of the relationship between division and works planning units and an explanation of how both long and short-range planning is accomplished and an illustration of the major steps and principles involved in production and shipment scheduling.

Mr. Lawrence also reviewed the major problems that exist in any production planning effort and others peculiar to Geneva works. No attempt was made to cover the entire range of the many specific items that sometimes cause best laid plans to go astray, and no attempt was made to compare Geneva's problems with those of other fully integrated steel producing plants, since other plants have problems peculiar to their operation that may or may not exist at Geneva works. Good production planning provides the coordination required so that all departments can work together effectively and economically to satisfy customer's service and delivery requirements. It is of greatest value when production is not as planned, for it is in these periods that greatest risks to maximum production, minimum costs and optimum customer service exists. Production planning is adequate only when needed schedule and production changes can be made successfully and in an orderly manner, with full anticipation of all of the major factors which influence plant operations, unnecessary costs and optimum customer service performance. — **Reported by Edward Flanders for Utah.**

High-School Boys Visit Montreal Plant

P. M. Howard, Chairman of the Educational Committee, and W. V. Vincent, Chairman of the Student Affairs Committee of the Montreal Chapter, Conducted 27 Students From the Montreal High School Through the Rolls-Royce of Canada Ltd. Plant in Montreal. The boys were very interested in the talks given by Phil Howard, which is quite evident in the picture above showing Phil explaining the operation of one of the machines

Presents Current Ideas on Grinding

Leo P. Tarasov, Norton Co., Presented a Talk on "Current Ideas About Grinding" at a Meeting in Rhode Island. Shown are, from left: William Matthew, vice-chairman; Walter Saunders, past chairman; Jerry Watrous, Northampton Cutlery Co.; and Dr. Tarasov. (Report by M. C. Battey)

Vacuum Melting Is Milwaukee Topic

A. M. Aksoy, Chief Metallurgist, Vacuum Metals Corp., Presented a Talk on "Vacuum Melting in Metallurgy" at a Meeting Held by Milwaukee Chapter. He is shown, left, with Walter J. Puzach, metallurgist, Ampco Metal, Inc.

Speaker: A. M. Aksoy
Vacuum Metals Corp.

Members of the **Milwaukee Chapter** heard an informative talk on "Vacuum Melting in Metallurgy" by A. M. Aksoy, chief metallurgist of the Vacuum Metals Corp. Division of the Crucible Steel Co. of America.

Increasing demands for metals with more stringent requirements used in aircraft, electronic and nuclear power applications has created a need for alloys which can stand high temperatures under heavy stresses, have higher impact properties, better ductility—and for cleaner steels. This need was satisfied with the development of a special melting technique designed to eliminate or minimize impurities.

Historically vacuum melting is not new. It was first developed about 65 years ago and used on a laboratory scale until 1920. World War II saw rapid advances in high vacuum technology and, at present, pressures of one micron are attainable commercially.

Vacuum degassing, also known as the Bochumer Verein Process, employs the use of conventionally melted steel which is poured in a mold housed in a vacuum chamber. Metal degassed in this manner is not susceptible to flaking, has better surface quality and improved hot working characteristics.

Vacuum induction melting is a semicontinuous operation in which carefully selected material is introduced into a vacuum chamber, through a charging lock, melted in an induction furnace and poured into a mold which is removed from the vacuum chamber through a mold lock. A 3000-lb. unit at the Vacuum Metals Corp. plant in Syracuse, N. Y., is the largest of its kind. Deoxidation is carried out by carbon or hydrogen, carbon preferred. Carefully prepared alloy additions are made toward the end of the cycle, at which time volatile elements may be added.

The speaker then discussed in detail the properties of vacuum induction melted alloys and compared them with conventionally melted materials. The properties improved by vacuum induction melting are stress rupture life and ductility, fatigue, impact, transverse ductility and hot workability.—**Reported by J. C. Truszynski for Milwaukee.**

—PROGRESS THROUGH METAL SCIENCE—

Speaks on Trace Elements In Metal at Indianapolis

Speaker: Jerome Strauss
Vanadium Corp. of America

Jerome Strauss, vice-president, Vanadium Corp. of America, gave a talk on "Trace Elements in Metals" at a meeting held in **Indianapolis.**

Mr. Strauss' talk included part of the subject matter of the Gillett Memorial Lecture, with additions of new developments, both beneficial and detrimental. Since the coverage of this material is so extremely broad, it was possible to indicate only the wide range and to mention specifically a few of the major current interests.

Mr. Strauss pointed out several instances where small amounts of an element imparted desirable qualities to a particular metal or alloy at one quantity level, but at another quantity level imparted undesirable properties. Stress was laid upon the effect of purity of the basic metals upon the properties of alloys made from those metals.

Various examples were cited in both the ferrous and nonferrous fields where minute additions effect desirable changes in the characteristics of metals. Among the additions mentioned were arsenic, bismuth, cadmium, tin, magnesium, phosphorous, sulphur, silicon, sodium, beryllium and boron. Among the properties affected are tensile strength at room temperatures and at high temperatures, magnetic permeability, grain size control, hardenability, machinability and corrosion resistance.

Mr. Strauss illustrated his talk with graphs and charts and quotes from current literature.—**Reported by Dorothy Holbrook for Indianapolis.**

—MODERN METALS FORETELL TOMORROW'S MARVELS—

High-Temperature Alloys Described at Chattanooga

Speaker: F. Sidney Badger, Jr.
Haynes Stellite Co.

At a recent meeting, members of the **Chattanooga Chapter** heard a talk on "High-Temperature Alloys" by Sidney Badger, Jr., of the Haynes Stellite Division of Union Carbide Co. Mr. Badger gave a history of the Haynes Co., which began making chromium-cobalt alloys for cutlery and machining tools in 1906 and which produced Stellite alloy tools for machining shells during World War I. Later, Union Carbide Co. bought the Haynes patents and discontinued the cutlery alloys in order to concentrate on alloy castings.

Today the needs of defense for high-temperature alloys has given emphasis to their development and a great deal of research is being done on them. The four chief fields for heavy alloys are gas turbines, supersonic aircraft, atomic reactors and corrosion applications.

Jet engines use alloys of either nickel or cobalt-base with cobalt-base alloys favored so far in this country. A typical cobalt-base alloy contains 20% chromium, 10% nickel, 3% iron and 15% tungsten. A typical nickel-base alloy contains 15% chromium, 2.5% cobalt, 6% molybdenum, 2.25% aluminum and 2.75% titanium. Such alloys are intended for short-term high-temperature service (for example, 200 hours at 1650° F.).

Mr. Badger gave data showing the chemical composition of many of these alloys and their physical properties and comparisons between them, then answered questions from the floor on them.—**Reported by J. A. McMinn for Chattanooga.**

Metallurgical News and Developments

Devoted to News in the Metals Field of Special Interest to Students and Others

A Department of *Metals Review*, published by the
American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

Substitute for Tin—A chemical surface treatment, the Hinac Process, which provides a substitute for tin, as well as giving chemical and corrosion resistance to a wide range of metals, has been developed by Heintz Manufacturing Co. as part of its continuing research program on rustproofing and finishing of metals. Hinac treated blackplate (plain carbon steel) is being produced by Bethlehem Steel Co. and utilized by major can manufacturers as a substitute for tinplate in the making of detergent containers.

Magnetism Conference—The American Institute of Electric Engineers, in cooperation with the American Physical Society, American Institute of Mining and Metallurgical Engineers, Institute of Radio Engineers and Office of Naval Research, will hold a conference on "Magnetism and Magnetic Materials" at Hotel Sheraton-Park, Washington, D.C., Nov. 18-20. Details from: Local Conference Committee Chairman, L. R. Maxwell, U. S. Naval Ordnance Laboratory, Silver Spring, Md.

Oxygen Plant—The world's largest single-unit oxygen producing plant for steel mill service has commenced operation at the Duquesne Works, U. S. Steel Corp. Built, operated and owned by Linde Co., the plant has a rated capacity of over 500 tons of oxygen per day.

New Plants—Arwood Precision Casting Corp. is expanding its West Coast operations to meet requirements of the aircraft, rocket and missile companies plus general Western expansion for nonferrous castings as well as steel, with completion of negotiations for purchase of Duncan-Rohne Co., largest producer of nonferrous investment castings on the West Coast, and Malco Metal Products Co., both of North Hollywood, Calif.

Sulphur Removal—A sulphur removal process in which molten iron and caustic soda are fed continuously into an apparatus where desulphurization occurs as the materials are intermixed has been announced by Battelle Memorial Institute, which developed the process doing research on desulphurization of iron for Diamond Alkali Co.

Hot Solder—A 95% zinc, 5% aluminum hot solder and special flux, which melts at 715 to 725° F. and can reduce joining costs by making high-temperature joints which previously had to be brazed or welded, has been developed by Aluminum Co. of America.

Stronger Steel—National Bureau of Standards has developed an ultra-high-strength steel that can be heat treated to a 285,000 psi. strength with sufficient ductility for structural applications. The steel is also reported to have high impact resistance.

International Meeting—The Iron and Steel Institute of Great Britain will join the Centre National de Recherches Metallurgiques, Groupement des Industries Siderurgiques Luxembourgeoises and Groupement des Hauts Fourneaux et Acieries Belges in an International Iron and Steel Meeting, to be held June 18 through June 28, 1958, successively in Liege, Luxemburg, Charleroi and Brussels. General theme of the meeting will be "New Developments in Steelmaking".

To Expand—Washington Steel Corp. has announced a one-million dollar expansion plan of its stainless steel sheet and strip facility at Washington, Pa.

Nitrogen Plant—A nitrogen plant that will take nitrogen out of the air and combine it with the hydrogen in coke oven gases to produce anhydrous ammonia has been opened at U. S. Steel's Geneva Works near Provo, Utah.

Research Gains—Research valued at $101,242,000 is now under way in the engineering laboratories of American colleges and universities. The Engineering College Research Council, research arm of the American Society for Engineering Education, has reported that at least 14,800 teachers and their students take an active part in these activities.

Up Facilities—Stroman Furnace & Engineering Co. has completed an expansion program consisting of an addition to complete its straight-line manufacturing operation covering a city block area. Engineering facilities and personnel have been doubled.

Radiation Research—Basic experimental and theoretical research to explain the effects of radiation damage on semiconducting materials is in progress at Battelle Memorial Institute, under a contract with Wright Air Development Center. Advances made in design of weapons and weapon systems have created a need for more detailed knowledge of the properties of all kinds of materials, particularly of solid-state electronic devices that may be called on to operate at high ambient temperatures and in strong fields of radiation. Knowledge of the mechanism of radiation damage will aid in determining which semiconducting materials can be used for fabrication of electronic components to function best in relatively intense radiation fields.

Vacuum Furnace—Allegheny Ludlum Steel Corp. has placed in operation a furnace for melting high-purity superalloys under vacuum. The furnace, using the consumable electrode remelting process, is capable of producing 26-in. diam. ingots, weighing up to 12,000 lb.

Graduate Program—A metallurgy graduate program will start in the next quarter at the University of Denver. Featuring early evening classes and laboratory work, the program has been designed for individuals employed full-time in the Denver area, and will lead to a M.S. degree in metallurgy, to meet the increased demand by industry, government and research organizations for metallurgists with advanced degrees.

Nuclear Aid—A 90-ft. aluminum tube with an intricate mirror and lens system which permits workers to sit safely behind heavy shielding while they watch the performance of a nuclear reactor has been developed by General Electric Co. engineers and installed at the A.E.C.'s National Reactor Testing Station in Idaho Falls, Idaho. The periscope will aid in development work on a nuclear propulsion system for aircraft.

Classes to Be Held—Podbielniak Institute, Chicago, will hold four two-week sessions on "Vapor Phase Chromatographic Techniques" and "Low and High-Temperature Distillation" during its 1957-58 session. First class starts on Sept. 23. Write: Helen Kastrube, 341 E. Ohio St., Chicago 11.

A.S.M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared at the Center for Documentation and Communication Research,
Western Reserve University, Cleveland,
With the Cooperation of the John Crerar Library, Chicago.

Annotations carrying the designation (CMA) following the reference are published also in *Crerar Metals Abstracts.*

General Metallurgy

281-A. Methods for Reclaiming and Processing Scrap From Steel Plant Slags and Refuse. Lawrence J. Fritz. *Iron and Steel Engineer,* v. 34, Apr. 1957, p. 95-97.

Description of wasted slag and refuse and inefficient slag yard scrap recovery operations. Recovery operations can be profitable; in a typical plant with a production of 2,500,000 ingot tons, some 50,000 tons can be recovered.
(A11d; ST, RM-p, RM-q)

282-A. Hawaii Bauxite; Outlook for a New Alumina Industry in the West. Pt. 1. Roy Fellom, Jr. *Light Metal Age,* v. 15, Apr. 1957, p. 12-19.

Location, nature, extent, origin and possibilities of economic development of Hawaii bauxite deposits. (A4n; Al)

283-A. New Horizons for Lithium. P. E. Landolt. *Mining Engineering,* v. 9, Apr. 1957, p. 460-464.

Brief report on explored reserves, mining methods, concentration methods, extraction processes, present and probable future consumption of lithium.
(A11a, B general, C general; Li)

284-A. (Italian.) **On the Manufacturing Technique of Etruscan Mirrors.** C. Panseri and M. Leoni. *Metallurgia Italiana,* v. 49, Apr. 1957, p. 233-241.

Description of the manufacture of Etruscan bronze mirrors, ascertained on the basis of accurate metallographic studies made on ten mirrors found in the Etruscan excavations. (A2; Cu-s)

285-A. Polonium—the Neglected Element. W. C. Fernelius. *Atomics and Nuclear Energy,* v. 8, May 1957, p. 173-174.

Separation, properties and compounds of polonium. (A general; Po)

286-A. Research and the Future of Iron and Steel Making. Charles Goodeve. *Australasian Engineer,* no. 46, Mar. 7, 1957, p. 59-60.

Brief remarks on modern steelmaking, and in particular on Australian steel research.
(A9, D general; ST)

287-A. A Metallurgist's View of Metallurgy. Earle E. Schumacher. *Bell Laboratories Record,* v. 35, May 1957, p. 161-167.

From the precise measurement of elusive physical and electrical properties to the formulation of specific alloys tailored to meet rigid design specifications, the metallurgist's skills must embrace a variety of techniques and fundamental processes. (A general)

288-A. Role of Electrolytic Manganese in the Metal Industries. E. H. Bucknal. *India Section of the Electrochemical Society, Bulletin,* v. 5, July 1956, p. 56-57.

Use of ferromanganese in the production of low-alloy steels, stainless steel, toolsteel, screw steel, silicon electrical steel and in steel castings; in the manufacture of manganese steel and welding steel; as a substitute for nickel in stainless steel and nonferrous alloys; as a substitute for copper and zinc in brass. 5 ref.
(A general; Fe, Mn, AD-n)

289-A. Effective Control of Welding Fumes. Stan E. Nelson. *Institution of Heating and Ventilating Engineers, Journal,* v. 25, Apr. 1957, p. 18-25.

Trials to determine specific requirements of air volumes and velocities, hood sizes and shapes, to produce minimum air-flow velocity at the weld, to insure control of fumes and to permit reasonable freedom from interference with general welding operations.
(A8a, K general)

290-A. Clean Air Conference. J. M. Beskine. *Iron and Steel,* v. 30, Apr. 1957, p. 143-146.

Summary of papers and discussion on air pollution problems, with brief descriptions of manual and electrostatic cleaners in elimination of dust and smoke problems in cupola, openhearth, arc, bessemer, blast and heat treatment furnaces; measurement of dust. (A8a, 1-2)

The subject coding at the end of the annotations refers to the revised edition of the ASM-SLA Metallurgical Literature Classification. The revision is currently being completed by the A.S.M. Committee on Literature Classification, and will be published later in the year. A schedule of the principal headings in the revised version was published in the February issue.

291-A. Cyanide Plating Waste Disposal. D. R. Johnson. *Metal Finishing,* v. 55, June 1957, p. 85-87.

Six methods investigated and results indicated that heating the waste solution with sodium hydroxide and aeration is a rapid, cheap and reasonably safe disposal method. 3 ref. (A8b; L17)

292-A. Science for Electroplaters. Pt. 25. Waste Disposal. L. Serota. *Metal Finishing,* v. 55, June 1957, p. 88-90.

Treatment methods commonly employed or considered include recovery or reclaim for re-use of plating wastes; modification of processes; lagoons; chemical treatment. (A8b, L17)

293-A. Uranium Deposits of Northeastern Washington. H. W. Norman. *Mining Engineering,* v. 9, June 1957, p. 662-666.

History and prospects of future development stimulated by a local market. (A4n; U)

294-A. Prospects for Rutile. J. A. Dunn and J. W. Morgan. *Mining Journal,* v. 248, May 10, 1957, p. 586-587. (CMA)

The demand for rutile and the expansion of the rutile industry are discussed in the light of short-term factors such as uncertainty between rutile and ilmenite as a raw material, and recent expansion beyond demands for normal consumption. The ease of working beach sand deposits is a temptation to the rapid opening of new leases and can quickly lead to overproduction. A return to the high rutile prices of last year is not expected. (A4n; Ti, RM-n)

295-A. Safety Geared to New Shop Tempo. R. G. Phelps. *Steel,* v. 140, May 6, 1957, p. 92-95.

Safety equipment and practices in new openhearth shop at Inland Steel Co. (A7p, D2)

296-A. (German.) **Properties and Application of Titanium Nitride and Titanium Carbide.** A. Münster. *Angewandte Chemie,* v. 69, May 7, 1957, p. 281-290. (CMA)

Recent literature on the preparation, properties and applications of titanium nitride and titanium carbide is surveyed. The author's contribution to the manufacturing of titanium carbide coatings on steel and cast iron is briefly outlined. It is a modified van Arkel vapor plating procedure (deposition of TiC from a gas mixture of $TiCl_4$, hydrocarbon and hydrogen). The modification consists of (1) the use of

lower temperatures (about 950° C.) which do not affect the mechanical properties of the metal being coated, (2) a close adjustment of the equilibrium proportion of the amounts of hydrogen and hydrocarbon, to avoid precipitation of free carbon, and (3) the selection of an appropriate catalyst. The properties of TiN and TiC are examined in the light of recent studies on the nature of chemical bonds in the crystalline structure of these substances and on the crystal energy levels. 64 ref. (A general; Ti, 14-18)

297-A. (German.) **Production of High Speed Steel in the German Democratic Republic.** Karlheinz Werner. *Neue Hütte,* v. 2, Apr. 1957, p. 214-219.

Melting process, charge, furnace practice and casting conditions; description of the soft annealing process; the most favorable temperature of deformation; influence of the degree of deformation on the structural constitution; appropriate utilization of the steel. 25 ref. (A general; TS-m)

298-A. (Russian.) **Industrial Types of Titanium Deposits in Capitalist Countries.** V. N. Kotlyar and B. V. Kristal'nyi *Gornyi Zhurnal,* Apr. 1957, p. 69-73. (CMA)

Industrially exploited deposits of ilmenite and rutile are of three different origins: magmatic, metamorphic and sedimentary. Magmatic deposits are: (1) lenses or dykes of iron-titanium ores in anorthosites (Adirondacks, Wyoming, Colorado, Virginia, Quebec, Norway); (2) lenses of iron-titanium ores in gabbros (California, Egypt); (3) veins with rutile and ilmenite in nepheline-syenites (Arkansas, Norway). Metamorphic deposits are: (1) rutile ores in granogneisses (recently discovered important deposit of Fuerto Angel in Mexico); (2) quartzites enriched in brookite, and orthorhombic TiO_2 (Arkansas). Sedimentary deposits are: (1) pre-quaternary sands and clays enriched in titanium minerals (Wyoming, Japan); (2) quaternary and recent shore sands containing ilmenite, rutile, zircon and monazite (Florida, Brazil, Union of South Africa, French West Africa, Egypt, Ceylon, India, Australia). In 1954, 60% of ilmenite came from sources of magmatic origin, and 40% from recent sands; the present tendency is to shift the leading part to recent sands. In 1954, 1% of rutile came from magmatic deposits, 99% from recent sands; with the forthcoming exploitation of Puerto Angel metamorphies, the distribution is expected to be: magmatic sources 2%, metamorphic 15%, recent 83%. 29 ref. (A11a; Ti)

299-A. Review of Iron and Steel Literature for 1956. Pt. 2. V. S. Polansky. *Blast Furnace and Steel Plant,* v. 45, May 1957, p. 501-504, 513.

Lists books and pamphlets (foreign and U.S.) together with U.S. Government publications of interest to iron and steel industry. (A general; Fe, ST)

300-A. Magnetic Cleaning of Roll Coolant. A. L. Wilson, Jr. *British Steelmaker,* v. 23, May 1957, p. 146-148.

Magnetic drum-type separators can achieve over 85% reduction of contaminant load in rolling mill coolant; both magnetically responsive material and tramp oil handled by separators. (A8b, W13h; NM-h)

301-A. Report of the Castings Research Laboratory. No. 7. Waseda University, Tokyo, Japan. *Castings,* v. 3, Mar. 1957, p. 34-35.

Lists titles of 17 articles on cast iron and other cast metals published in English by Waseda University. (A general; CI, 5)

302-A. Refining and Using Nickel. L. B. Pfeil. *Engineer,* v. 203, May 10, 1957, p. 720-721.

Old and new methods of refining, some of the uses of nickel, and the development of the nimonic series of alloys. (A general, C general; Ni, 17-7)

303-A. Will Lower Prices Help Titanium? K. W. Bennett. *Iron Age,* v. 179, June 13, 1957, p. 88-89. (CMA)

Cutbacks in defense spending are the first serious threat to the growth of the titanium industry. U.S. Air Force procurement has slowed and rolling mill schedules have been cut back. Producers plan to counter the threat by price cuts, and further cuts may be possible if Armour's titanium tetrachloride process is adopted. Titanium continues to expand but operations may be scheduled at 60% by July. Temporarily stalled expansions may be permanently delayed. The shock may halt the acceptance of wider applications in many fields. (A4q; Ti)

304-A. Blast Furnace U.S.A. Pt. 1. Colonial Ironmakers. M. O. Holowaty and C. M. Squarcy. *Journal of Metals,* v. 9, May 1957, p. 657-661.

Early iron production in Maryland and Virginia with details of mining methods and operations at Spotswood Principio and Accokeek furnaces. (To be continued.) (A2, D1)

305-A. Some Aspects of Government-Sponsored Research in Metallurgy. Julius J. Harwood. *Journal of Metals,* v. 9, May 1957, p. 665-670.

Presents significant scientific and administrative aspects of U.S. Government contract basic research program in metallurgy and ceramics. (A9k)

306-A. Symposium on Government-Sponsored Research Metallurgy Research Program of the Air Force Office of Scientific Research, of the National Science Foundation, of the Office of Naval Research, of the Atomic Energy Commission, of the Aeronautical Research Laboratory. *Journal of Metals,* v. 9, May 1957, p. 671-676.

Brief notes on important policies and range and objectives of research of government supported agencies. (A9h)

307-A. Safety Precautions in the Fabrication and Use of Titanium. *Light Metal Age,* v. 15, June 1957, p. 19-20. (CMA)

The hazards in the processing, fabrication and use of titanium are slight but must be recognized. Fires from titanium turnings and particles are minimized by using sufficient cutting fluid and frequent removal of the titanium waste. Precautions are necessary in chemical cleaning. Cooling and slow bleeding in dry air prevent ignition of the contents in sponge manufacture. Handling titanium fines and powder requires the most care. Cool, ventilated storage places are best. The AEC recommendation for extinguishing fires in titanium is to spread dry dolomite around the area and over it until coverage is complete. Burning powder should be removed from cement to prevent explosions. (A7p; Ti)

308-A. Columbium and Its Uses. G. L. Miller. *Materials and Methods,* v. 45, May 1957, p. 131-135.

Availability, methods of production, mechanical and physical properties; effect of high temperatures on these properties; properties of columbium alloyed with molybdenum, platinum, tantalum, titanium, tungsten, vanadium or zirconium. Potential applications are nuclear reactors, jet engines and chemical industry. 21 ref. (A general; Cb)

309-A. Where to Use Heat Resistant, High Alloy Castings. E. A. Schoefer. *Materials and Methods,* v. 45, June 1957, p. 122-125, 150-155.

Illustrated guide to the selection of castings of heat resistant Fe-Cr-Ni alloys for use as recuperators, ore roasters, burner nozzles, oil refinery heaters, heat treating furnace components; data on alloy types, their composition, physical properties, mechanical properties, elevated-temperature properties, fabricating possibilities and uses. (A general, W27p, 17-7; SGA-h, 5)

A.S.M.-W.R.U. Program Ready for Test Runs

The pilot plant mechanized literature searching project being conducted for the American Society for Metals at Western Reserve University has now reached the initial testing stage. More than 5000 abstracts representing much of the important metallurgical literature of 1955 have been processed and will be ready for machine searching in September. An experimental searching selector has been built at the Center for Documentation and Communication Research at Western Reserve University which can be used to make test searches.

members are urged to participate in the test program by submitting typical questions and subjects for literature searches. A limited number of searches will be made covering only the literature of 1955. For those problems selected, pertinent information retrieved will be sent to the inquirer at no charge.

For details, write:

American Society for Metals
Attention: Marjorie R. Hyslop
7301 Euclid Ave.
Cleveland 3, Ohio

310-A. Copperbelt of Northern Rhodesia. *Mining Engineering,* v. 9, May 1957, p. 517-523.

History of copper mining and refining in Rhodesia; ore type and reserves, present installations and future of industry.
(A4n, B general, C general; Cu, RM-n)

311-A. Mining East Texas Iron Ore. V. F. Malone. *Mining Engineering,* v. 9, May 1957, p. 524-527.

Nature and extent of ore deposits; mining methods and beneficiation process. (A11a, B12, B14; Fe, RM-n)

312-A. Aluminum Overseas. *Modern Metals,* v. 13, May 1957, p. 112.

Expansion of bauxite mining, aluminum reduction and fabrication facilities is planned or under way in Africa, Australia, India, Ireland, Japan, Spain and South America.
(A4n, B general, C general; Al)

313-A. Evaluation of Data on Zirconium-Uranium Alloys. F. A. Rough. *U.S. Atomic Energy Commission,* BMI-1030, Aug. 19, 1957. 105 p. (CMA)

The literature pertaining to U-Zr alloys was surveyed and the available data analyzed. Attempts have been made to reconcile the divergent forms of the phase diagram. Features discussed are the structure of the epsilon-phase, two modes of transformation for the beta-phase, the typical microstructures produced by the transformation, by cold working and by annealing, hardness, tensile and creep data, and physical properties. Techniques for hot and cold rolling, extruding and swaging. Corrosion resistance is reviewed and the effect of additions on it is discussed. (A general; Zr, U)

314-A. Applications, Properties and Fabrication of Thermenol Type Alloys. J. F. Nachman and W. J. Buehler. U.S. Navy, Bureau of Ordnance, Report 4237. *U.S. Office of Technical Services,* PB 121098, May 1956, 52 p. (CMA)

Thermenol (Fe-Al-Mo) is a magnetic, refractory and nonstrategic alloy. Other properties discussed include hardness, tensile properties, stress-rupture properties, and corrosion and oxidation resistance. Alloy preparation and its hot and cold working described.
(A general; SGA-h, Fe, Al, Mo)

315-A. New High Temperature Intermetallic Materials. R. D. Grinthal. U.S. Air Force, Wright Air Development Center, Technical Report 53-190. Pt. 5. *U.S. Office of Technical Services,* PB 121891, Nov. 1956, 65 p. (CMA)

Data reported for the effect of a copper additive on the heat treatment, oxidation resistance and physical properties of $MoSi_2$. X-ray diffraction was used to identify 11 compositions in the Cr-Ti-Si system. The Ti-Al-Ni system was studied in the triangular region which includes NiAl, NiTi and TiAl. The effect of adding copper to Cr_2Ti was determined. X-ray oxidation and physical data are reported.
(A general, M24d, 2-10; SGA-h)

316-A. (French.) **Uranium Ore Deposits at Entraygues (Aveyron).** R. Pulou. *Société d'Histoire Naturelle de Toulouse, Bulletin,* v. 91, May 30, 1956, p. 175-190.

Geology of region; description of pitchblende and of previously undiscovered phosphated ores; study of uranium-bearing ores found in area. 10 ref. (A4n; U, RM-n)

317-A. (German.) **Checking Production and Controlling Waste.** Helmut Schrader. *Giesserei,* v. 44, June 6, 1957, p. 350-351.

Classification of the rejected material into main and secondary groups; recording waste by means of a card index. (A8; RM-q)

318-A. (German.) **Status of and Trends in the Development of the Metallurgy of Titanium.** L. F. Gillemot. *Neue Heutte,* v. 2, Feb-Mar. 1957, p. 84-91. (CMA)

The current status of the metallurgy of titanium and recent developments in the art. Much of the review is devoted to a fairly detailed description of the reduction of titanium tetrachloride with magnesium or sodium.
(A general, C26; Ti)

319-A. (Book.) **Applied Metallurgy for Engineers.** Malcolm S. Burton. 407 p. 1956. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. $7.50.

Text for survey courses in metallurgical technology. Discussion of techniques and illustrations of industrial equipment are included but are secondary to presentation of metallurgical principles. Questions and list of references conclude each chapter. (A general)

320-A. (Book.) **Manufacturing Processes, 4th Ed.** Myron L. Begeman. 612 p. 1957. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $8.

Three entirely new chapters appear: manufacturing processes; metal cutting; and electroforming and coating processes. Conforming to recent developments, all other chapters were revised and particularly those on welding, heat treatment of steel, press work, plastic molding, melting and metal casting, and foundry equipment and procedures. (A general, 18)

321-A. (Book—Italian.) **Plastic Working of Light Alloys.** C. Panseri. 846 p. 1956. Editoriale Hoepli, Milan, Italy.

History of aluminum; production of ingots for plastic working; theory of plastic deformation; hardening, crystalline orientation and recrystallization; heat treatment; corrosion resistance; all types of hot and cold working; machining; joining; finishing, surface conditioning and coating; hardened, standard and improved alloys; alloys for special applications; appendix of standards, atomic weights, conversion temperatures, etc. (A general; Al)

B Ore and Raw Material Preparation

59-B. Rheological Properties of Water Suspensions of Finely Subdivided Magnetite, Galena and Ferrosilicon. G. W. Govier, C. A. Shook and E. O. Lilge. *Canadian Mining and Metallurgical Bulletin,* v. 50, May 1957, p. 261-268.

Settling rate measurements indicate relative stability of the suspensions. Measurements of consistency were made with a Fann Model 35 rotational viscometer. Abnormal or non-Newtonian behavior was observed in the case of each medium, the apparent viscosity being dependent upon the rate of shear or the intensity of motion.
(B14; Fe, Pb, Si, AD-n)

60-B. Blast Furnace Coke Tested at High Temperature. Michael O. Holowaty and Charles M. Squarcy. *Journal of Metals,* v. 9, Apr. 1957, p. 577-581.

Description and procedure for high-temperature compression test designed to predict coke performance and correlation of test with performance in blast furnace. 6 ref. (B18n, D1; RM-j43)

61-B. Zinc Industry in Australia. *Australasian Manufacturer,* v. 42, Apr. 6, 1957, p. 58-60, 65.

Brief survey of mining, milling, roasting, leaching, electrolysis, melting and casting operations currently employed.
(B general, C general; Zn)

62-B. Ore Dressing Developments in Australia, 1956. Pt. 1. Crushing, Grinding, Gravity, Concentration, Flotation. H. H. Dunkin. *Chemical Engineering and Mining Reviews,* v. 49, Mar. 15, 1957, p. 177-181.

Survey of ore production, exploration and new equipment. (B14)

63-B. How Gorno Recovers Oxidized Zinc. Marcello Bill. *Engineering and Mining Journal,* v. 158, Apr. 1957, p. 82-86.

Zinc ore dressing techniques, new flotation reagents and refining procedures. (B14; Zn)

64-B. How to Process Alluvial Sand for Tantalum-Columbium. J. E. Shelton and W. A. Stickney. *Engineering and Mining Journal,* v. 158, Apr. 1957, p. 93-95.

A combination of gravity, magnetic and high-tension electrostatic separation is a potential means of producing a tantalum-columbium concentrate from alluvial sand.
(B14; Ta, Cb)

65-B. Importance of Magnesium to the Scrap Trade. David Edelstein. *Waste Trade Journal,* v. 103, May 11, 1957, p. 36-37, 49.

Problem of contaminants in magnesium scrap; copper, aluminum, iron and nonmetallic materials. Tests for distinguishing between aluminum and magnesium; safe practice in handling and shipping. (B23; Mg, RM-p)

66-B. (German.) **Production of Finest Ore Agglomerates and Their Behavior in the Blast Furnace.** Ludwig von Bogdandy and Rudolf Schmolke. *Stahl und Eisen,* v. 77, May 30, 1957, p. 685-693.

Permeability to gas of the sintering mixture when sintering ore fines; improvement of the permeability to gas by submitting the raw mixture to a pelletizing process; "hard foam" process of the Hüttenwerk Oberhausen A.G.; saving in fuel and increase of production; briquetting trials with ore fines; verification of the behavior of briquettes and "hard foam" sinter in the blast furnace by means of radioactive isotopes. (B16, D1; Fe)

67-B. (German.) **Sinter Cooling—an Essential Element of Modern Sintering Plants.** Günther Brandes and Helmut Wendeborn. *Stahl und Eisen,* v. 77, May 30, 1957, p. 693-701.

Sinter cooling by water sprays, by passing the sintered product through a store yard or through a cooling bin; cooling by air suction; operational results of an experimental cooler; cooling curve of sinter; development of the straight cooling band and of the circular cooler; experiences gathered in practical operation. (B16a, 1-2; Fe)

68-B. H-Iron Process. A. M. Squires and C. A. Johnson. *Journal of Metals,* v. 9, Apr. 1957, p. 586-590.

Principle of process and operation of demonstration scale plant for the direct reduction of finely ground iron ore with hydrogen. Uses fluidized bed at about 1000° F. and with pressure in the range of 250 psi. (B15q; Fe)

69-B. Mineralogical Approach to the Development of the Uranium Extraction Processes Practiced on the the Witwatersrand. W. R. Libenberg. *South African Institute of Mining and Metallurgy, Journal,* v. 57, Nov. 1956, p. 153-208.

Chemical and microscopic results show the distribution of the uraniferous constituents throughout some of the products obtained by gravity, flotation and electromagnetic treatments of the crushed conglomerate and leach residues. 12 ref. (B14; U, RM-n)

70-B. (French.) **Physical Chemistry of Iron Ore Concentration.** A. Roos. *Le Génie Civil,* v. 134, Mar. 15, 1957, p. 129-133.

Theory of concentration; physical phenomena and chemical reactions; role of slag; crystallographic study of the concentrate; concentration practice. (B general; Fe, RM-n)

Extraction and Refining

181-C. On the Mathematical Theory of Zone-Melting. I. Braun and S. Marshall. *British Journal of Applied Physics,* v. 8, Apr. 1957, p. 157-162.

A complete solution is presented of the equations governing the redistribution of solutes in zone-melting processes. The effect of "normal freezing" in the last zone-length of a bar is treated. The solutions hold for all values of the distribution coefficient K. Numerical calculations have been made of the concentration profiles resulting from repeated zone melting. Specimen graphs are given. (C28k)

182-C. Ion-Exchange and Solvent-Extraction Studies With Polonium. J. Danon and A. A. L. Zamith. *Journal of Physical Chemistry,* v. 61, Apr. 1957, p. 431-434.

The ion-exchange and solvent-extraction behavior of polonium in hydrochloric and nitric acid media. The tendency of polonium to form complexes and its oxidation-reduction reactions are discussed. (C19s; Po)

183-C. Floating-Zone Melting of Refractory Metals by Electron Bombardment. A. Calverley, M. Davis and R. F. Lever. *Journal of Scientific Instruments,* v. 34, Apr. 1957, p. 142-147.

An apparatus which produces floating liquid zones in vertical rods of refractory metals is described. Movement of the zone along the specimen can purify it in three ways, namely, outgassing on a vacuum fusion, evaporation of volatile impurities, and segregation of impurities in the liquid zone. (C28k, 1-2; EG-d)

184-C. Resin-in-Pulp Method for Recovery of Uranium. R. F. Hollis and C. K. McArthur. *Mining Engineering,* v. 9, Apr. 1957, p. 443-449.

Method for recovering dissolved uranium from acid-leached pulps by direct contact with heads made of strong base anion exchange resins. Process development, variables, chemistry and design and operation of resin in pulp pilot plant. (C19s; U)

185-C. Development of the Acid Leaching Process for the Extraction and Recovery of Uranium From Rand Cyanide Residues. P. A. Laxen and M. G. Atmore. *South Africar Institute of Mining and Metallurgy, Journal,* v. 57, Jan. 1957, p. 359-375.

The recovery of uranium from pregnant solutions initially comprised precipitation at pH 6-7 and retreatment of the low-grade precipitate. The precipitation of high-grade uranous phosphate was developed on a pilot-plant scale. This procedure was superceded by the effective and currently used ion exchange process. (C19n, C19s; U)

186-C. History of the Development of the Ion Exchange Process as Applied to Uranium Extraction. R. E. Robinson and R. G. Velthuis. *South African Institute of Mining and Metallurgy, Journal,* v. 57, Jan. 1957, p. 376-385.

Principles of the ion exchange process; "life" of resins; development of the anion exchange process. (C19s; U)

187-C. Review of Uranium Leaching Practice in South Africa. E. T. Pinkney. *South African Institute of Mining and Metallurgy, Journal,* v. 57, Jan. 1957, p. 386-402.

Leaching practice and reagent preparation and handling; tables of equipment for uranium leaching. 4 ref. (C19n; U)

188-C. Calculations for Continuous Casting. J. Czikel. *Henry Brutcher Translation* No. 3853, 2 p. (From *Neue Hütte,* v. 1, no. 9, 1956, p. 561-562.) Henry Brutcher, Altadena, Calif.

The two basic requirements for satisfactory results in continuous casting. Nomograms for calculating the rate of descent of the bar and the pouring rate in continuous casting. (C5q, D9q)

189-C. Zone Purification of Reactive Metals. R. L. Smith and J. L. Rutherford. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957.

Apparatus and technique for purifying reactive high melting point metals such as iron, titanium, zirconium, nickel and molybdenum by floating zone method. Radioactive tracers proved useful in determining conditions to effect redistribution of solute. Data from tensile tests on purified iron at liquid nitrogen and liquid helium temperatures. (C28k, 1-2; Fe, Ti, Zr, Ni, Mo)

190-C. Tributyl Phosphate Processing of Plutonium-Aluminum Alloy Fuels. R. G. Hart. *Atomic Energy of Canada Ltd.,* CRDC-630, Mar. 1957, 24 p.

A system of extraction using 20% tributyl phosphate-soltrol would give good plutonium recovery but poor fission product decontamination. (C19, T11g; Pu, Al)

191-C. Vertical Casting Wheel Now in Full Production at Utah Copper Refinery. *Engineering and Mining Journal,* v. 158, Apr. 1957, p. 75-77.

Vertical casting wheel design and operation. (C5, 1-2; Cu)

192-C. Titanium Metallurgy. Pt. III. Reduce Titanium Chloride in Fused Alkalinous Chloride by Solutions of Alkalinous Metals. R. S. Dean, L. D. Resnick and I. Hornstein. *Industrial Laboratories,* v. 8, June 1957, p. 93-95. (CMA)

A study of the reaction between fused alkalinous chloride solutions of the alkali metal and titanium chlorides showed that the activity of the metal was not a linear function of its concentration. The analysis of titanium present in the melts and its valence state is necessary for an understanding of the equilibria involved. The analytical method used was based on the liberation of hydrogen by sodium from acidified ferric salts while Ti^{++} reduces the salts without gas formation. Procedures are given for the analysis of an electrolyte and graphs are shown. (C1p; Ti)

193-C. Cheaper Titanium. *Chemical and Engineering News,* v. 35, June 17, 1957, p. 83. (CMA)

Armour Research Foundation has a new method of making pure titanium tetrachloride from ilmenite, which was developed by Friedric Schossberger. Ilmenite is dissolved in sulphuric acid and the iron content is reduced by two controlled crystallizations if its level interferes. The sulphuric solution is then treated with hydrogen chloride at 0° C. and saturated with potassium chloride. Further cooling precipitates K_2TiCl_6, from which titanium tetrachloride is recovered on heating in the range 330-400° C. Iron remains behind. Cheaper ore and lower temperatures can be used. (C19; Ti, RM-n)

194-C. Progress in the Continuous Casting of Tin Bronzes. E. C. Ellwood. *Foundry Trade Journal,* v. 102, May 23, 1957, p. 627-633.

History and development of vertical continuous casting process; machine design and processes used in several countries; die design, lubrication and the limitations of continuous castings; comparison of mechanical properties of leaded gunmetal continuously and sand-cast. 7 ref. (C5q, 1-2; Cu, *Sn*)

195-C. Selective Sulfation for Cadmium Recovery at Josephtown Smelter. R. E. Lund and D. E. Warnes. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 608-611.

Sulphation pattern of cadmium oxide by zinc sulphate and sulphating characteristics of other sulphides and oxides at elevated temperatures was investigated. Heat treatment to sulphate cadimum oxide allows water leaching for cadmium recovery and has commerical application in treatment of cadmium fume obtained in sintering of zinc concentrate. 3 ref. (C19, A8a; Cd)

196-C. Continuous Cast Light Alloy Ingot Surfaces. P. N. Nielsen and V. Kondic. *Metal Industry,* v. 90, Apr. 12, 1957, p. 285-288.

Study of mold surface condition, type of lubricant and casting characteristics of alloying in relation to rippling, hot tears, exudation, scores, striations and dross on the surface of continuously cast ingot of light alloys. Theoretical considerations and practical application. 3 ref. (C5q; E4-a39, 9-21)

197-C. First Ferro-Uranium Made in America. Clarence T. Patterson. *Metal Progress,* v. 71, June 1957, p. 85-89.

Uranium oxide byproduct from radium refining was first smelted in an Acheson-type resistance furnace. Commercial alloy was later pro-

duced for toolsteel makers in a small carbon arc furnace, lined with sintered U_3O_8, by first forming a carbide from an oxide-coke mix, distilling off the carbon, and then dissolving boiler plate punchings in the molten uranium. (C21d, A2; U, AD-n)

198-C. Processing of Uranium-Zirconium Alloys. J. W. Holladay, et al. *U.S. Atomic Energy Commission,* BMI-877, Oct. 20, 1953, 21 p. (CMA)

The preparation of U-Zr alloys by arc melting and induction melting was studied using tungsten arcs, helium atmospheres and water-cooled copper crucibles. Some double-melted alloys were not homogeneous and triple melting was used in some cases. Some arc-melted ternary alloys were sensitive to thermal shock and cracked when melting was stopped, but only one binary alloy cracked. Graphite crucibles were used in induction melting to give a higher carbon content. Forging and rolling data were obtained for U-Zr, U-Mo, U-Ti, U-Zr-Mo, U-Zr-Nb, U-Zr-Ti, U-Zr-Th and U-Zr-Sn. (C5h, C5j, 1-2; U, Zr)

199-C. Process for Separating Thorium Compounds From Monazite Sands. K. G. Shaw, M. Smutz and G. L. Bridger. *U.S. Atomic Energy Commission,* ISC-407, Jan. 1954, 107 p. (CMA)

Economic separation of thorium compounds from monazite sands after H_2SO_4 digestion and the treatment of byproduct lanthanons and uranium. After the thorium has been separated from the solution, the lanthanon phosphates are fractionally precipitated at about pH 2.3. Uranium phosphate and the rest of the lanthanons are precipitated at pH 6.0. Pilot plant study shows that the method proposed is about $2.37 per lb. cheaper than the Battelle method. (C27; Th)

200-C. Low-Hafnium Zirconium Project, Progress Report for Jan. 16, 1950 to Mar. 16, 1950. S. C. Cogburn, Jr., and H. M. Fisher. *U.S. Atomic Energy Commission, NYO-1082,* Mar. 28, 1950, 27 p. (CMA)

When propanol was changed to methanol for the decomposition of low-hafnium zirconium complex, the phosphorus impurity was reduced by 50 to 75%. Research on the direct production of $ZrCl_4$ from the decomposition of the $ZrCl_4 \cdot POCl_3$ has been negative, and some metathetic reactions studied are, so far, impractical. Using low-hafnium "Zirkite" ore would double the capacity of the pilot plant. (C1p; Zr, RM-n)

201-C. On the Anhydrous Reduced Halides of Zirconium and Hafnium. E. M. Larsen and J. J. Leddy. University of Wisconsin, Technical Report 9, under contract N7onr-28504. *U.S. Office of Technical Services,* PB 123133, Aug. 1955, 21 p. (CMA)

Reduction of zirconium or hafnium tetrahalides to the trihalides (solid) with a zirconium or hafnium reductant was studied and X-ray data on the trihalides obtained. A preparative method was devised using high temperatures and pressures. (C1p; Zr, Hf)

202-C. (Russian.) **Mechanism of Formation of Zirconium Sponge in the Magnesium-Thermal Process of Preparing Zirconium.** F. G. Reshetnikov and E. N. Oblomeev. *Atomnaya Energiya,* no. 2, v. 5, May 1957, p. 459-462. (CMA)

By adding to magnesium a few percent of a soluble but nonvolatile ingredient, such as aluminum or tin, it becomes possible to solve the question of the origin of the zirconium sponge on the walls of the container above the level of the reaction bath. It was found that this sponge is formed in the reaction between vapors of zirconium chloride and liquid magnesium that rises by capillary action through the sponge already formed. The effect of the perimeter of the container having been thus brought to light, it is recommended that this effect be increased by adding internal partitions. 7 ref. (C26; Zr, 6-24)

D Iron and Steelmaking

150-D. Importance of Gas Solid Contact in the Production of Pig Iron. T. L. Joseph. *Blast Furnace and Steel Plant,* v. 45, Apr. 1957, p. 379-384.

Reviews raw materials, gases and basic features of smelting process in blast furnace. Arrangement of materials, particle size, resistance to gas flow, gas velocity across various planes, variations in temperature, shaft temperature and iron analysis. (To be continued.) (D1; Fe)

151-D. Review of Iron and Steel Literature for 1956. V. S. Polansky. *Blast Furnace and Steel Plant,* v. 45, Apr. 1957, p. 400-403, 407, 408, 421, 424, 425.

Lists books and pamphlets of interest to iron and steel industry published during 1956. (D general; Fe, ST)

152-D. Design and Operation of a Blast Furnace With a Carbon Bosh Lining. E. K. Miller, Jr. *Iron and Steel Engineer,* v. 34, Apr. 1957, p. 91-94.

Experience at Gary Steel Works with carbon-lined bosh shows smoother furnace operation, less cooler trouble, larger working volume and lower fuel rates, to offset higher initial cost. (D1b, W17g, 1-2; Fe)

153-D. Ironmaking in the USSR. E. W. Voice and S. Klemantaski. *Journal of Metals,* v. 9, Apr. 1957, p. 592-596.

Outstanding features of blast furnace design and operations, use of high top pressure, high blast temperature, high sinter burden and blast humidification. (D1)

154-D. Melting of Stainless Steel With Oxygen Lancing (in Electric Arc Furnace). N. I. Shutkin. *Henry Brutcher Translation* No. 3759, 2 p. (From *Metallurg,* v. 1, no. 1, 1956, p. 10-11). Henry Brutcher, Altadena, Calif.

Improved technique of remelting stainless scrap with oxidation of excessive carbon in charge by oxygen lancing; description of oxygen-gasifying equipment; advantages of proposed melting practice over conventional remelting. (D5g, 1-2; SS, RM-p)

155-D. Results of Experiments on Vacuum Casting of Steel. Pt. 1. Ingot Stage. Z. Eminger and F. Kinsky. *Henry Brutcher Translation* No. 3861, 11 p. (From *Hutnicke Listy,* v. 11, no. 6, 1956, p. 345-355). Henry Brutcher, Altadena, Calif.

Vacuum casting equipment; 'particulars on the simplified equipment being developed; influence of vacuum casting of a Cr-Ni-Mo steel upon the properties of ingots ranging in weight from 3 lb. to 5.2 net tons; minimum ingot weight to insure the benefits of vacuum casting. (D9, 1-23; AY)

156-D. Use of Steam-Enriched Blast Furnace Wind. F. Houdek. *Henry Brutcher Translation* No. 3869, 3 p. (From *Hutnik,* v. 5, no. 7, 1956, p. 194-196). Henry Brutcher, Altadena, Calif.

Report on Russian and Czech blast furnaces where a blast enriched with 10-15 grains of steam per cu. ft. gave an increase of 5-10% in iron production and a simultaneous 2-4% reduction in coke consumption, because of higher blast temperatures. (D1h; Fe)

157-D. Fundamentals and Operating Data on Production of Steel in a Rotary Furnace. R. Graef. *Henry Brutcher Translation* No. 3910, 10 p. (From *Stahl und Eisen,* v. 77, no. 1, 1957, p. 1-10). Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 93-D, 1957. (D10; ST)

158-D. Degassing of Steel in Vacuum. H. Zakowa and R. Radzwicki. *Henry Brutcher Translation* No. 3921, 5 p. (From *Biuletyn Informacyjny,* v. 7, no. 11, 1956, p. 41-45). Henry Brutcher, Altadena, Calif.

Vacuum chamber for degassing steel in ladle; results obtained when the steel was allowed to solidify in the ladle and when the steel was held under reduced pressure for a short time and then poured into mold with access of air. Pouring of ingots into molds under vacuum; development of a hood for individual molds. (D9s, 1-23; ST)

159-D. Effect of Blowing With Carbon Monoxide Gas in Electric Furnaces Upon Steel Quality. A. V. Vishnyakov and A. M. Samarin. *Henry Brutcher Translation* No. 3926, 5 p. (From *Biuletyn Informacyjny, SSSR, OTN,* no. 3, Mar. 1954, p. 102-109). Henry Brutcher, Altadena, Calif.

Exploration of possibilities of removing hydrogen and nitrogen from liquid steel and of stepping up the desulphurizing and deoxidizing rates by blowing CO through it. Experiments on blowing CO through steel bath in a high-frequency furnace without a slag blanket, and effect of this treatment on gas content, nonmetallic inclusions, and on compactness of ingots and their columnar crystal zone. (D6g, D11r; ST)

160-D. (French.) **Study of Desulphurization in the Basic Bessemer Steel Plant.** A. Decker. *Revue Universelle des Mines,* v. 13, May 1957, p. 165-212.

Theoretical and experimental study of the desulphurization of iron before refining; thermodynamic equilibria of the constituents of steel and slag at the end of conversion; principal differences which exist between iron and openhearth steel before and after blasting; desulphurization in the Thomas converter. Concludes that the desulphurization of iron is a physical and mechanical problem rather than a chemical one. 71 ref. (D11h, D3, 1-15; ST)

161-D. "Cyclosteel": Steel Direct From Ore. G. K. Bhat. *Iron Age,* v. 179, May 23, 1957, p. 129-130.

British process for direct reduc-

tion of fine iron ore with powdered coal; system uses mixture of powdered coal and oxygen to react with heated ore.
(D8j; ST, Fe, RM-n, RM-j42)

162-D. New Electric Arc Furnaces. 70-Ton Units at Krefeld (Germany). E. Pakulla. *Iron and Coal Trades Review*, v. 174, Apr. 26, 1957, p. 967-971.

Previously abstracted from original. See item 101-D, 1957.
(D5, W18)

163-D. Oxygen Application in the Basic-Bessemer Process. M. Michaud and M. Zehringer. *Iron and Coal Trades Review*, v. 174, Apr. 26, 1957, p. 979-984.

Advantages of oxygen enrichment; problem of supplying French steel works with oxygen. 8 ref.
(D3f, 1-15; ST)

164-D. Climate of the Open-Hearth Furnace. J. H. Chesters. *Iron and Steel*, v. 30, Apr. 1957, p. 125-129.

Climatic effects and wear of silica roof of openhearth furnace. Relationships between iron oxide concentration and gas system, flow patterns, temperature, time and the rate of roof wear. Gaps in present knowledge. (D2h, 1-2; ST, RM-h)

165-D. Method Used During Forced Interruptions in Open Hearth Operations. George A. Ferris. *Journal of Metals*, v. 9, Apr. 1957, p. 591.

Replies received from questionnaires sent to 47 plants show four major methods of shutting down openhearth furnaces. (D2)

166-D. Oxygen Conversion in the Open Hearth. *Steel*, v. 140, June 3, 1957, p. 92-94.

With oxygen and no external heat, quality carbon steel was made in openhearth at Inland Steel. Waste gases escaped through both checkers, and oxygen was poured in at the slag-metal interface by lances inserted through three doors.
(D2g; CN)

167-D. Scrap in Steel Mill Operations. J. P. Orton. *Waste Trade Journal*, v. 103, May 11, 1957, p. 29-32.

Problem of steel scrap in the openhearth furnace in relation to impurities and their effect on mechanical properties of steel products. (D2; ST, RM-p)

168-D. (German.) **Deoxidation and Technological Characteristics of Killed Basic Converter Steels. Pt. 1. Deoxidation Process Together With Aspect and Composition of the Deoxidation Products.** Erwin Plöckinger and Rupert Rosegger. *Stahl und Eisen*, v. 77, May 30, 1957, p. 701-714.

Deoxidation phenomena and separation of the reaction residues in the deoxidation of steels with silicon, silicon and aluminum combined and with aluminum alone; representation of the results obtained with low and high-carbon steels by means of three-dimensional diagrams. Aspect of the isolated inclusions; contents of inclusions as dependent on the amount of aluminum added. (D11r, ST-g, 1-15)

169-D. (French.) **Manufacture of Spheroidal Quality Cast Iron From Sardinian Iron Ores in Electric Reduction Furnaces.** Giuseppi Zuliani. *Journal du Four Electrique*, no. 2, Mar-Apr. 1957, p. 59-62.

Use of Sardinian ores and charcoal in special low-temperature reduction process gives cast iron superior to any other type produced by the coke process for subsequent spheroidizing. Analysis of Sardinian ores. (D8n; CI-r)

170-D. (Swedish.) **Steel Refining With Oxygen in the Rotary Furnace by the Kaldo Process.** Bo Kalling and Folke Johansson. *Jernkontorets Annaler*, v. 141, no. 4, 1957, p. 189-205.

Method developed at Domnarfvet steel works, Sweden, of refining ordinary high-phosphorus basic bessemer pig iron into steel comparable in quality with openhearth steel; technical and economic advantages. 4 ref. (D10; ST)

171-D. Importance of Gas Solid Contact in the Production of Pig Iron. Pt. 2. T. L. Joseph. *Blast Furnace and Steel Plant*, v. 45, May 1957, p. 489-493.

Relationship of blast pressure and uniformity of particle size to channeling in furnace bed and percentage of voids. Variation of hearth temperature and coke consumption with air volume and temperature of blast. Gas-solid contact with beneficiated raw materials.
(D11g, D1; CI-a)

172-D. Desulphurization of Pig Iron With Solid Lime. Bo Kalling and Sven Eketorp. *Blast Furnace and Steel Plant*, v. 45, May 1957, p. 494-497, 513.

Kalling-Domnarvet process uses powdered lime and brings it into contact with the pig iron by the use of a rotary kiln or furnace. Process metallurgy; furnace construction and operation.
(D11n, D8j, 1-2; CI-a, RM-b)

173-D. "Kaldo" Rotary-Oxygen Steelmaking Process. Bo Kalling and Folke Johansson. *Foundry Trade Journal*, v. 102, May 23, 1957, p. 636-637.

Side-blown rotary oxygen converter used in Swedish plant to process high-phosphorus pig iron. (D10)

174-D. Carbon Equivalent Concept. K. G. Lewis and J. McCracken. *Iron and Steel*, v. 30, May 1957, p. 165-169.

Control of carbon content in furnace charge and time of melting in the manufacture of quality forging steels in basic openhearth; gives derivation of the carbon equivalent concept for determining oxidation requirements of elements present in scrap and hot metal, and application of concept in calculating metallurgical load. 20 ref. (To be continued.) (D11r, D2; ST)

175-D. Influence of Slag Properties on Pig Composition. A. J. Burgess and B. G. Baldwin. *Iron and Steel Institute, Journal*, v. 186, June 1957, p. 227-235.

Results obtained during blast-furnace trial at the Steel Co. of Wales to study relation between metal composition and slag properties: furnace practice; experimental techniques used; iron temperature and sampling; slag temperature and sampling; results; conclusions. 11 ref.
(D11n, D1b; CI-a)

176-D. Effect of Oxygen Input Rates in the Decarburization of Chromium Steel. G. W. Healy and D. C. Hilty. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, May 1957, p. 695-707.

Heat loss studies were combined with results of previous investigations for evaluating the heat balance during the oxidizing period of chromium steel heats in terms of rate of oxygen input in relation to bath composition, bath temperature and furnace size. Carbon content at end of oxygen blow is estimated when initial composition and operating variables are known. 12 ref.
(D11r; Ay, *Cr*)

177-D. Good News About All-Basic Open Hearths. *Steel*, v. 140, Apr. 15, 1957, p. 134-136.

Summarizes experiences at several steel companies with all-basic openhearths. Some advantages found were longer roof life, lower fuel consumption, increased production.
(D2, 1-15, 1-2)

178-D. (French.) **International Executive Committee of International Research Committee on Low-Shaft Blast Furnaces. Brief Report on the Low-Shaft Blast Furnace at Ougrée.** *Revue Universelle des Mines*, v. 13, Feb. 1957, p. 84-90.

Description of plant and raw materials used. Results of three years of research. (D8p; Fe)

179-D. (German.) **Change in the Conception of Requirements to Be Met by Foundry Coke.** Christian Gapp. *Giesserei*, v. 44, June 6, 1957, p. 347-350.

Historical development of the requirements to be met by foundry coke, particularly as regards reactivity, degree of graphitization, sulphur and ash contents as well as other features; characteristics of the HC-coke (high-carbon coke). 20 ref.
(D11j; RM-j43)

180-D. (German.) **Hot-Blast Cupola in the Openhearth Steel Plant.** Albert-Friedrich Oberhofer. *Stahl und Eisen*, v. 77, May 16, 1957, p. 643-651.

Importance of the cupola furnace for the openhearth steel plant; steel scrap and direct processed blooms as charging materials; trials with raw ore; desulphurization of the iron as dependent on the operating conditions; behavior of the iron oxides; variables affecting the recarburization. (D2, 1-2)

181-D. (Book.) **Deoxidation of Steel.** Charles H. Herty. 700 p. Apr. 26, 1957. American Institute of Mining, Metallurgical and Petroleum Engineers, Inc., 29 W. 39th St., New York, N. Y. $10.

A memorial volume reprinting nine significant papers by C. H. Herty published during the late 20's and early 30's. (D11r, A2; ST)

E Foundry

198-E. How to Pour a Mould. *Australasian Manufacture*, v. 42, Apr. 6, 1957, p. 43-45.

Specific recommendations every foundryman can follow to insure smooth function of the pouring operations. (E23)

199-E. Cooperation Between Designer and Foundryman. M. M. Hallett. *British Cast Iron Research Assoc. Journal of Research and Development*, v. 6, Apr. 1957, p. 530-545.

Certain characteristic defects of gray iron castings and illustrations of successful improvements effected in design. (E general, 17-1; CN-n, 9)

200-E. Hot Blast Package Reduces Melting Costs. *Canadian Metals*, v. 20, Apr. 1957, p. 46-48.

Advantages of use of cupola blast heater at Canadian iron foundry.
(E10a, 1-2)

201-E. Steelfoundry Moulding Materials. J. M. Middleton. *Foundry*

Trade Journal, v. 102, Apr. 18, 1957, p. 469-475.

Surveys present trend in molding and coremaking methods and materials. Section on molding discusses silica, zircon, olivine and other substitutes for silica. Sand reclamation, bentonites, other bonding materials and pH control. Linseed oil, resin and other core-binders and additives discussed in section on coremaking. 20 ref.
(E19, E21; NM-f 45, ST)

202-E. Foundry Industry of Finland. Eugen Autere. *Foundry Trade Journal*, v. 102, Apr. 25, 1957, p. 501-508.

Over-all survey of the foundry industry in Finland with detailed notes on a few of the larger foundries. (E general)

203-E. Control of Aluminum-Alloy Melting Practice. *Foundry Trade Journal*, v. 102, Apr. 25, 1957, p. 509-512.

Control of contamination from melting crucible, gas absorption, time at pouring temperature, temperature range and special precautions for aluminum-silicon and aluminum-magnesium alloys.
(E10p; Al, *Si, Mg*)

204-E. Guidance in Casting Brass and Bronze Test-Bars. *Foundry Trade Journal*, v. 102, Apr. 25, 1957, p. 513-514.

Committee report recommending techniques for casting test bars of aluminum bronzes and high-tensile brasses. Problems in obtaining test bars of copper-tin alloys.
(E11, 1-10; Cu-n, Cu-s)

205-E. Viscosity and Mould Filling Properties. *Light Metals*, v. 20, Apr. 1957, p. 131-133.

Reviews internal variables and external influences on mold filling properties of aluminum alloys. Apparatus and procedure for determination of molten metal viscosity; data on flow time of two aluminum alloys and compares flow time with cast spiral characteristics. 6 ref.
(E25p, P10f; Al)

206-E. New Applications for Shell Casting. H. G. Sieggreen. *Machine Design*, v. 29, May 2, 1957, p. 112-114.

Advantages of shell moldings, examples and designs. (E16c)

207-E. Relation of Runner Layout to Ease of Trimming. H. K. Barton and L. C. Barton. *Machinery*, v. 90, Apr. 26, 1957, p. 945-955.

Emphasizes specific requirements of subsequent trimming operations in connection with design and layout of runners and gates for feeding mold cavity. (E22p, E24h)

208-E. Automatic Processes in Die-Casting Production. H. K. Barton. *Metal Industry*, v. 90, May 10, 1957, p. 391-395; disc. 399.

Automation applied to metal handling, machine operation, trimming and fettling, machining and polishing. Extent of automation is dependent upon quantities of die castings to be produced to a single design and by a single plant.
(E13, 1-2, 18-24)

209-E. Improvement of Sand Testing Techniques for Shell Mold and Core Sands. P. J. Ahearn, F. C. Quigley and J. F. Wallace. Watertown Arsenal. *U.S. Office of Technical Services*, PB 121412, July 1956, 35 p. $1.

A new design was developed for tensile test briquettes which minimizes the concentration of stresses at the critical testing zone. A higher apparent tensile strength was demonstrated for all sands tested and reproducibility was improved for rammed resin and oil-bonded sands. (E18r)

210-E. Operating Hot-Blast Cupolas. R. Drechsler. *Henry Brutcher Translation* No. 3935, 3 p. (From *Giessereitechnik*, v. 2, no. 1, 1956, p. 4-6.) Henry Brutcher, Altadena, Calif.

Conversion of two cold blast cupolas to operation on hot blast. Description of plant; blast flow and electric wiring in hot blast cupolas.
(E10a, 1-2)

211-E. (French.) **Gravity Casting in Chill Molds. Generalities. Applications to Light Alloys.** Maurice Billing. *Fonderie*, no. 135, Apr. 1957, p. 161-169.

Field of application of this process; comparison with sand casting; melting; equipment; techniques; methods of avoiding typical flaws.
(E12; EG-a39)

212-E. (French.) **Present Status of Die Casting Evaluated—Progress Since 1952.** Achille Brizon. *Fonderie*, no. 136, May 1957, p. 197-208.

Impact of American techniques closely studied in 1952. Present practice of die casting in France from the point of view of raw materials, equipment, machinery and techniques. (E13)

213-E. (French.) **Improvement in the Process of Cupola Use: a New Cupola With Superheating for the Production of High-Quality Cast Iron.** Jean Guillamon. *Fonderie Belge*, no. 2, Feb. 1957, p. 15-21.

New technique of furnace operation capable of furnishing cast iron of quasi-constant chemical composition at very high temperatures without an increase in melting costs. Analysis of results. 5 ref.
(E10a; CI)

214-E. (French.) **Avoidance of Overweight Ingots in Iron Founding.** *Journal d'Informations Techniques des Industries de la Fonderie*, no. 83, Dec. 1956-Jan. 1957, p. 1-4.

Outlines method for exact calculation of the weight of iron cast resulting in considerable economies.
(E11, A5d; CI)

215-E. (French.) **Notes on a Manufacturing Practice.** *Journal d'Informations Techniques des Industries de la Fonderie*, no. 83, Dec. 1956-Jan. 1957, p. 7-8.

Description of chill mold casting of copper plates of 99.7% copper content. (E12; Cu)

216-E. (French.) **Concerning Explosions in the Cupola Furnace.** *Journal d'Informations Techniques des Industries de la Fonderie*, no. 85, Mar. 1957, p. 10-11.

Enumeration of explosive risks and analysis of probable causes. Outlines specific precautions to be taken in furnace operation.
(E10a, A7p)

217-E. (German.) **Investigation on the Refractory Lining, the Blowing Practice and the Size of Hot Blast Cupolas Used in Steel Plants.** Wilhelm Patterson and Albert F. Oberhofer. *Giesserei*, v. 44, Apr. 25, 1957, p. 227-237.

Description of the furnace; materials charged and analyses of iron and slag; cross-section of the cupola in the tuyere plane; heat balance of the plant; temperature measurement and the temperature of iron and slag; combustion ratios.
(E10a, W18d, 1-2; ST)

218-E. Quicker Dies, Lower Costs With Shaw Process. *American Machinist*, v. 101, Apr. 8, 1957, p. 126-128.

New ceramic mold technique in which a flexible mold made from pattern is stripped off and hardened by heating. Method is as accurate as lost-wax process. (E16, W19q, 1-2)

219-E. Sound Investment Castings. *Australasian Manufacturer*, v. 41, Mar. 23, 1957, p. 32-38.

Remedies for dip coat spalling, buckling, gas defects, dirt inclusions, slag inclusions, mold cracks in investment casting. (E15, 9)

220-E. Casting Properties of Some Nickel-Base and Other Nickel-Containing Alloys. D. R. Wood and J. F. Gregg. *British Foundryman*, v. 50, Jan. 1957, p. 2-14.

Spiral pattern testing procedure used to measure the casting properties of Inconel with small variations in composition and the castability of a wide range of nickel-base and other nickel-containing alloys. Investigation shows fluidity as conventionally measured to be dependent on degree of superheat, but casting quality as measured by spiral cast is related to composition of melt as well as degree of superheat. 6 ref. (E25p; Ni)

221-E. Development of Internal Stresses Leading to the Cracking of Grey Iron Castings. H. T. Angus and W. G. Tonks. *British Foundryman*, v. 50, Jan. 1957, p. 14-22.

Principles involved in development of casting stresses during solidification and cooling; effect of metal composition, microstructure, methods of running, time and method of knock-out and other variables on the development of casting stresses; examples from thin-sectioned boilers to heavy machinery castings and causes of failure. 12 ref. (E25n, Q25; CI-n, 9-22)

222-E. Planning and Operating of a Mechanized Core Shop for the Blowing of Small and Medium Size Cores. J. Hill. *British Foundryman*, v. 50, Jan. 1957, p. 23-29.

Factors in the layout and operation of a core shop using three different types of core blowing machines. (E21g, 1-2)

223-E. Design and Operation of Two Water-Cooled Cupolas. D. W. Berridge and J. R. Hawley. *British Foundryman*, v. 50, Feb. 1957, p. 53-61.

Details of the design and operation of basic-lined and acid-lined water cooled cupolas; information on fluxing, melting and tapping procedures; problems and set-backs in the water cooling systems; comparison of performance and advantages gained by cooling. (E10a, 1-2)

224-B. Flowability of Foundry Sands. A. Tipper. *British Foundryman*, v. 50, Feb. 1957, p. 62-65.

Literature review of property of foundry sand generally called flowability or ramability; covers definition, test method and influence of clay, sand, grain shape and moisture content on flowability. 14 ref.
(E18r)

225-E. Services for the Moulder. H. P. Millar. *British Foundryman*, v. 50, Feb. 1957, p. 66-75.

For efficient use of a molder's skill he must have raw materials, equipment, housing and other services. (E19, A5)

226-E. Some Aspects of Shell Moulding Theory. A. Braybrook and B. H. C. Waters. *British Foundryman*, v. 50, Feb. 1957, p. 77-94.

Consideration of theoretical aspects of shell molding with reference to factors affecting hot and cold strength hardness, permeability, use of precoated sand, gas content of shell mold, surface finish of casting, shell closing, running and feeding and pattern plate for shell molding. 37 ref. (E16c)

227-E. Metal Losses in Crucible Melting Practice. R. S. Jackson and D. W. Brown. *British Foundryman*, v. 50, Mar. 1957, p. 103-109.

Measurements to assess the effect metal losses made on a number of commonly used copper-base alloys melted in tilting and lift-out oil-fired crucible furnaces; practices included melting under charcoal or flux, contact with oxidizing or reducing furnace atmospheres. (E10p, 1-2)

228-E. Future Developments in the Founding of Metals. Frank Hudson. *British Foundryman*, v. 50, Mar. 1957, p. 143-154.

The foundry industry of the future requires closer study of the effect of such variables as casting design, casting properties, fuels and furnaces for melting. 10 ref. (E general)

229-E. Mould Drying. *British Foundryman*, v. 50, Apr. 1957, p. 169-183.

Factors involved in mold drying —moisture content, permeability and types of sand, temperature, time of drying, methods of heating and striking back after drying; results of laboratory and industrial tests; four methods based on electrical resistance for following moisture content. 4 ref. (E19)

230-E. Injection Processes in American Foundries. George P. Dahm and Chester E. Bieniosek. *British Foundryman*, v. 50, Apr. 1957, p. 190-196.

Injection processes depend on entraining finely divided solid material in a gas stream which then delivers the solid materials below the surface of metal bath. This technique has become a production tool for desulphurization, carburization and partial or full nodulization of cast iron. Injection of calcium carbide for desulphurization, graphite for carburization and nodulization brought about by magnesium and cerium additions enable foundries to diversify without need for additional melting units. (E25; CI, AD)

231-E. Surface Sinking Defects in Grey Iron Light Castings. I. C. H. Hughes. *British Foundryman*, v. 50, Apr. 1957, p. 202-210.

Investigation aimed at determining cause of sinking defects in thin sections of iron castings. Effect of carbon, silicon, manganese and phosphorus, of pouring temperature and of inoculation on the occurrence of sinking defects in test plate castings 3/16 to 5/16 in. thick. 6 ref. (E25q, 2-10, CI-n, 9)

232-E. Brass Foundry. Pt. 22. Cleaning Room Practice. Harry St. John. *Foundry*, v. 85, May 1957, p. 168-170.

Removal of cores, gates, sprues, cleaning by sand or shot blasting, sorting, repair procedures and inspection in brass foundry. (E24h, L10c, S general; Cu-n)

233-E. Which Core Process? Warner B. Bishop. *Foundry*, v. 85, May 1957, p. 180-183.

Conventional shell, gas setting and air setting core processes, advantages and weaknesses. (E21)

234-E. Casting Quality Enhanced by Good Core Properties. R. W. Carpenter. *Foundry*, v. 85, May 1957, p. 352-356.

Use of dextrose binder and ammonium sulphate; catalyst provides cores that are fast baking and have little tendency to crack. Binder gives fast clean mulling and no stripping problem when release agent is used. (E18n, E21)

235-E. Clyde Alloy Steel Company, Ltd. *Foundry Trade Journal*, v. 102, May 9, 1957, p. 571-577.

Sand handling, molding, coring, cleaning, trimming, blasting, testing and other practices in a jobbing foundry in Scotland which makes a wide variety of steel castings, weighing from 1 lb. to 18 tons, from carbon and high-alloy steels. (E general; CN, AY, SS)

236-E. Metallurgical Principles of the Control of Quality of Non-Ferrous Castings. R. W. Ruddle and A. Cibula. *Institute of Metals Journal*, v. 85, Mar. 1957, p. 265-292.

Relation between defects in castings and the flow of liquid metal through gating system and into mold cavity. Rate and mechanisms in freezing metals and alloys; control of gas content, grain refinement, number of nonmetallic inclusions and the design of test bars. 122 ref. (E25n; EG-a, 9-18, 9-19)

237-E. Control of Quality in the Production of Nickel Alloy Sand Castings. D. R. Wood and J. F. Gregg. *Institute of Metals Journal*, v. 85, Mar. 1957, p. 319-329.

Effect on mechanical properties of nickel alloys of variations in amounts of carbon, silicon, copper, magnesium, sulphur and lead and factors affecting welding properties and castability; choice of melting furnace, furnace lining, raw materials for melting, techniques of alloying, degassing, deoxidation and sulphur control; precautions in molding and casting. 8 ref. (E11, Q general, 2-10; Ni)

238-E. Control of Quality of Pressure Die-Castings. H. J. Sharp. *Institute of Metals Journal*, v. 85, Mar. 1957, p. 330-338.

Measures to be taken for production of high-quality pressure die castings include selection of suitable machines and alloys for pressure die casting, detection and elimination of defects, control of metal quality, casting and die design, maintenance of suitable heat balance in die cavity, control of metal flow into die, control of injection pressure. (E13)

239-E. New Pointers on CO_2 Molding. *Iron Age*, v. 179, Apr. 25, 1957, p. 99-101.

Report on a Japanese study gives data on effect of sodium silicate viscosity, gas treatment time, gas pressure, added organic binders on mold permeability and compressive strength. (E19)

240-E. Liquid Shrinkage. Problems of Compensation in Steel Castings. E. Longden. *Iron and Steel*, v. 30, Apr. 1957, p. 147-148.

Evaluates gating and feeding methods and casting design in connection with casting defects. Description of several insulation and exothermic reaction compounds used to prolong freezing period of feederhead metal. (To be continued.) (E22p, E22s; ST)

241-E. Line Production of Die Castings. H. K. Barton. *Machinery*, v. 90, Mar. 29, 1957, p. 707-719.

Plant layout, induction heating furnaces, holding furnaces, die casting machines, work conveyor system, scrap disposal equipment, trimming presses, ingot casting and metallurgical control and finishing operations in modern English plant making zinc die castings. (E13, 1-2; Zn)

242-E. Precision Investment Casting by the Mercast Process. *Machinery*, v. 90, Apr. 5, 1957, p. 736-742.

Typical British castings made with frozen mercury patterns, including aluminum wave guide components, copper alloy and steel castings; redesign of castings for full advantage of process use. (E15; Al, Cu, ST)

243-E. Precision Investment Casting by the Mercast Process. *Machinery*, v. 90, Apr. 12, 1957, p. 813-821.

Molding and casting methods, pattern die design and use in producing castings from frozen mercury pattern and ceramic mold in British plant. (E15, 1-2)

244-E. Line Production of Pressure Die Castings. *Mechanical World*, v. 141, May 1957, p. 223-225.

Modern metal feeding, casting and conveying methods applied to maximize economy and to exercise control of product quality. (E13, 18-24)

245-E. How to Mix Molding Sand Without Water. R. G. Megaw and K. A. Miericke. *Modern Castings*, v. 31, May 1957, p. 94-95.

Waterless sand mix bonded with oil and bentone produced variety of high-quality castings from aluminum, bronze, brass, nickel and stainless steel. (E18p)

246-E. Trimming Zinc Die Castings With Complete Safety. Roy Melinder. *Modern Machine Shop*, v. 30, June 1957, p. 114-115.

Using multiple-cavity dies, zinc diecast parts for miniature electric trains are safely trimmed in a 15-ton punch press with "dead" motor which eliminates loading hazards. (E24h; Zn, 5-11)

247-E. Line Production of Pressure Die Castings. *Process Control and Automation*, v. 4, May 1957, p. 159-161.

Advantages of automation—better quality, efficient tooling and lower cost. (E13, 18-24)

248-E. Shell Molding Makes Better Cast Crankshafts With Lower Foundry and Machining Costs. H. N. Bogart. *SAE Journal*, v. 65, May 1957, p. 26-27.

Advantages of shell molding crankshafts. (E16c, T21b; CI)

249-E. Improved Metals for Castings. *Steel*, June 3, 1957, p. 98-102.

Description of some advances revealed at the First Engineered Castings Show of the American Foundrymen's Society in Cincinnati such as calcium additions to improve gray iron, new steel which resists brittle fracture, a cupronickel casting alloy for corrosive marine service. (E general)

250-E. Proper Gating for Uniform Distribution of Mold Metal. Domenic Coccione. *Western Metals*, v. 15, May 1957, p. 60-61.

Gating methods and gating area for steel high-pressure cylinder as well as for Meehanite. (E22p; S'r, CI)

251-E. (German.) **Studies on the Susceptibility of Magnesium Die Castings to Shrinking and Cracking.** K. E. Mann. *Giesserei,* v. 44, May 23, 1957, p. 301-305.

Causes of hot tears and stress cracks and their prevention; trials with different alloy contents. (E13; Mg, 9-22)

252-E. (German.) **Raw Materials for the Foundry at the GIFA.** Franz Roll. *Giesserei,* v. 44, May 23, 1957, p. 308-314.

Melting materials; pig iron, ferroalloys; molding sands and additions; quartz sands, bentonites, auxiliary mold and core materials; heat exchangers; electrodes; refractories. (E general; CI-a, Fe, AD-n, NM-f45)

253-E. (German.) **Importance of High-Frequency Drying and Baking in the Foundry.** Emil Walther. *Giesserei,* v. 44, May 23, 1957, p. 316-318.

Power required and cost of drying; operation of high-frequency drying ovens. (E21h, 1-2)

254-E. (Russian.) **Selecting the Composition of Cast Iron and Study of Rational Technology for Casting Grinding Media.** O. A. Nesvizhskii. *Liteinoe Proizvodsvo,* no. 3, Mar. 1957, p. 1-4.

Discussion on grinding media, such as balls, rods and ovoids, widely used in mining, construction and chemical industries. Cast iron containing chromium, nickel and molybdenum as well as ordinary white cast iron may be used. The media may be cast in sand molds, chill molds with the use of vibration, or in a centrifugal machine. (E11, T28, 17-7; CI-p, CI-q)

255-E. (Russian.) **Casting System Using Restricted Gates.** B. V. Rabinovich. *Liteinoe Proizvodsvo,* no. 3, Mar. 1957, p. 4-9.

Slit-like gates for controlling the flow of metal are described. Depending on the problem created by the demand of the work, four types of restricted gates are used—single or double gates on one side of the runner, and single or double gates on both sides of the runner. Their use diminishes the entry of gases into the mold, prevents contamination by slag and provides an even flow of metal. (E22p)

256-E. (Russian.) **Cooling of Cast Plates in Sand Molds.** O. Y. Kotsyubinskii. *Liteinoe Proizvodsvo,* no. 3, Mar. 1957, p. 9-14.

Process of cooling of cast iron plates of unlimited extension is examined in all its phases. Theoretical discussion supported by extensive calculations. (E19; CI)

257-E. (Russian.) **Formation of Surface Gaseous Blow-Holes on Heats of Cast Iron Containing Magnesium.** A. D. Ushakov. *Liteinoe Proizvodsvo,* no. 3, Mar. 1957, p. 19-20.

With the help of radiographs obtained by the introduction of radioactive sulphur into the cast iron before alloying with magnesium it was established that the sulphur was unevenly distributed along highest layer of the casting. The inclusions are of spherical shape containing sulphur compounds. To avoid their formation it is necessary to superheat the molten metal and hold the heat until after the treatment with magnesium additives. (E25s; CI, Mg, AD-p, 9-18)

258-E. (Russian.) **Pouring of Cast Iron Cutters With Tungsten Carbide Inserts.** L. Z. Malisov. *Stanki i Instrument,* v. 28, Mar. 1957, p. 38-39.

Cutters are cast into usual sand molds into which the inserts are already placed. The insert is joined to the cast iron body by the casting process. Casting is done in such manner that bonding is assured by the proper pre-heating of the inserts. (E11; CI, W, 6-19)

259-E. Shell Moulding and CO_2 Processes. *Australasian Manufacturer,* v. 42, Apr. 20, 1957, p. 32-38, 92, 96.

Advantages and disadvantages; competitive position. 21 ref. (E16c, E21)

260-E. Observations on the Melting and Casting of Aluminum-Bronze Alloys With Special Reference to Test Bars. C. V. Wilson and E. V. Tull. *British Foundryman,* v. 50, May, 1957, p. 237-245.

Main difficulties encountered in melting and casting of these alloys; general principles for their solutions; factors affecting soundness; importance of casting design specifically for aluminum bronzes. Principles of sound casting are applied to production of test bars; influence of casting temperature on properties of these bars discussed. Effect of variations in composition, particularly aluminum content, upon physical properties is described. Properties of various standard alloys are surveyed and suggestions made concerning optimum compositions within appropriate specifications. 13 ref. (E10, E25, 1-4; Cu, *Al*)

261-E. Heterogeneous Distribution of Oxygen in Cast Iron. G. Blanc and A. Blondel. *British Foundryman,* v. 50, May 1957, p. 245-257.

Experimental vacuum fusion equipment and procedure described. Experiments were devoted particularly to effect on oxygen contents of sampling procedure in relation to location of samples, methods of casting, conditions of storage, types of mold material. Highest oxygen contents were noted near feeders and other areas where nonmetallic inclusions can be trapped and within 1 mm. of surface, especially after storage in air. Implication of these results on mode of occurrence of oxygen in cast iron is considered. 30 ref. (E25, S11r; CI, *O*)

262-E. Production Problems in the Manufacture of Alloy-Iron Castings. W. M. Lord. *British Foundryman,* v. 50, May 1957, p. 258-267.

Outline of improvements in production methods in small foundry to increase output and provide wide variety of alloyed and high-duty iron castings. Description of molding unit using special type of standard cast-iron molding box and motorized turnover machine; details of conversion of two cupolas to water cooling; production of spheroidal graphite cast iron; comments on necessary technical control and foundry planning. (E11; CI-q)

263-E. Aids to Production in a Jobbing Foundry. I. Rees and D. H. Snelson. *British Foundryman,* v. 50, May 1957, p. 267-288.

Core-assembly method of molding, CO_2 process, application of moldable types of exothermic feeding compound discussed from point of view of flexibility and increase of productivity. 6 ref. (E19, E22)

264-E. Castings Industry of the United Kingdom. D. H. Houseman. *Castings,* v. 3, Mar. 1957, p. 15-21.

Brief indication of size and scope of United Kingdom's castings industry. Important developments since 1945 include cupola with preheated blast, water cooling, improvements in refractories, development in rotary and electric furnaces, increasing use of CO_2 and shell molding processes, and automation in molding and cleaning. (E general, A4)

265-E. Modern Mechanised Foundry of Allied Ironfounders. *Commonwealth Engineer,* v. 44, Apr. 1, 1957, p. 65-67.

Automatic indexing molding machines, mechanized sand handling plant, hot blast recuperated cupolas and mechanical handling of raw materials are featured. (E general, W19, 1-2, 18-24)

266-E. Four 8½ Ton Cast Steel Ladles. *Commonwealth Engineer,* v. 44, Apr. 1, 1957, p. 85-86.

Problems of molding, melting and casting. (E11, W19b, 17-7; ST)

267-E. Precision Investment Casting Developments. W. N. Jones. *Foundry Trade Journal,* v. 102, May 2, 1957, p. 529-531.

Brief survey of basic process and recent trends; problems of design, dimensional tolerance and mechanical properties to be expected. (E15, 17-1)

268-E. Two Grey-Iron Foundries. M. M. Hallett. *Foundry Trade Journal,* v. 102, May 16, 1957, p. 597-602.

Equipment and processes at two British foundries including vertical hoist for charging cupolas, wet baffle spark-arrester, application of shell molding and annealing. (E general, 1-2)

269-E. Drying of Plaster Moulds by Immersed Electrical Wiring. *Foundry Trade Journal,* v. 102, May 16, 1957, p. 613.

Method for quick economical drying of gypsum plaster molds to be used in low pressure casting of aluminum match plate. (E16a, W19g, 1-2)

270-E. Metallurgical Control of Quality in the Production of Copper-Base Alloy Castings. A. R. French. *Institute of Metals, Journal,* v. 85, Mar. 1957, p. 293-315.

Extensive review on commonly used copper-base alloys; their constitution, effects of composition and structure on mechanical properties; influence of reducing gases and other impurities; control of metal quality during alloying and melting; tests for metal quality; modes of solidification; feeding and gating systems and control of casting quality. 124 ref. (E25, E22; Cu)

271-E. Liquid Shrinkage. Problems of Compensation in Steel Castings. E. Longden. *Iron and Steel,* v. 30, May 1957, p. 173-178.

Typical hydraulic cylinder types were used to illustrate various gating and feeding systems for pouring steel castings with special emphasis on obtaining progressive order of metals solidification. (To be concluded.) (E25n, E22; ST)

272-E. Status of the Technology for Casting Titanium. G. H. Schippereit, J. G. Jura and R. M. Lang. *Light Metal Age,* v. 15, June 1957, p. 16. (CMA)

Research progress relating to melting furnaces, mold materials and

titanium casting alloys is evaluated. The development of an inert, cheap mold material would be a major breakthrough. Best molds now are obtained from graphite; mold life may extend to 50 castings if draft is adequate, re-entrant angles are absent and expendable inserts are used. Skull melting furnaces look promising. Superheating of melts allows the gating systems to be small. (E general; Ti)

273-E. Schueler Automatic Shell Core Making Machine. *Machinery,* v. 90, Apr. 19, 1957, p. 885-887.

Automatic shell core-making machine uses pre-coated sand from pressurized copper for production of cores at rate of one per min. in core boxes of up to 12 cu. in.; sand bonded by electrically heated platens. (E21, E19c, 1-2)

274-E. Pressure Die Casting at the Works of Dyson and Co., Enfield (1919) Ltd. *Machinery,* v. 90, May 31, 1957, p. 1223-1232.

Large-scale casting of zinc and aluminum alloys. Atomic hydrogen welding used for adaptation and repair of dies. During initial stages of operation of new dies, detailed records are kept of machine settings which give best results. Techniques and dies employed; specifications of castings for oil pumps, office equipment; typewriter front bars, electrical switchgear boxes, electric motors, segmental tire molds.
(E13, T1, T10, 17-7; Zn, Al)

275-E. Automatic Processes in Die-Casting Production. H. K. Barton. *Metal Industry,* v. 90, May 3, 1957, p. 345-349.

Developments in electronic controls for casting cycle; mechanisms for automatic casting transfer and methods of meeting work handling problems. (To be concluded.)
(E13, 1-2)

276-E. Automatic Processes in the Foundry. J. B. McIntyre. *Metal Industry,* v. 90, May 3, 1957, p. 360-363, 368.

Die casting; control of sand moisture; cupola charging equipment; automatic molding machines of the jolt squeeze type; mechanized core production; cut-off machines; automatic shot blast cleaning; other techniques and equipment that have automated sections of foundry.
(E general, 18-24)

277-E. Die Casting Process. *Precision Metal Molding,* v. 15, May 1957, p. 33-38.

Characterizes process; lists metals that can be cast; accuracy obtainable; advantages and limitations of method. Twenty examples of aluminum, zinc and magnesium die castings. (E13; Al, Zn, Mg)

278-E. Permanent Mold Casting Process. *Precision Metal Molding,* v. 15, May 1957, p. 41-44.

Nature of the process; metals that can be cast; accuracy obtainable; advantages and limitations. Twelve examples of castings made with permanent mold process from aluminum alloys and other metals.
(E12)

279-E. Investment Casting Process. *Precision Metal Molding,* v. 15, May 1957, p. 45-50.

Characterizes process; lists metcan be cast; accuracy obtainable; advantages and limitations of method; 20 examples of castings made by investment process. (E15)

280-E. Plaster Mold Casting Process. *Precision Metal Molding,* v. 15, May 1957, p. 57-59.

Evaluates process; lists metals that may be cast; advantages; limitations and accuracy obtainable. Eight examples of castings made by plaster mold method. (E16a)

281-E. Shell Mold Casting Process. *Precision Metal Molding,* v. 15, May 1957, p. 61-63.

Characteristics of the process; metals that can be cast; accuracy obtainable; advantages and limitations of method. Eight examples of castings produced by shell molding processes. (E16c)

282-E. Hydraulic Trim Presses for Die Castings. *Precision Metal Molding,* v. 15, May 1957, p. 67-69.

Hydraulic presses for trimming parting line flash from diecastings; their adjustments and advantages.
(E24h, 1-2; 5-11)

283-E. More Shell Castings for Autos. *Steel,* v. 140, Apr. 15, 1957, p. 138, 141.

Castings produced in shell molds with close tolerances and cleaner surfaces. Used as automatic transmission, steering gear and other auto parts. (E16c, T21c, 17-7)

284-E. Birth of a Bell. *Tin and Its Uses,* no. 39, Summer 1957, p. 1-5.

Practices at a Whitechapel foundry in the founding of bells; bronze consisting of 24% tin and 75% copper is used. Techniques in molding with loam; pouring practices; a few of the famous bells produced in the foundry in the last 400 years.
(E11, T9r, 17-7; Cu-s)

285-E. (French.) **Melting Experiments in the Cupola With Oxygen Enriched Blast.** M. F. Kinet. *Fonderie Belge,* no. 3, Mar. 1957, p. 31-35.

Equipment; influence of the injection of oxygen on the lining, the proportion of coke, temperature of the cast iron, speed of combustion, hourly production rate; influence on the composition of cast iron; conclusions drawn. 9 ref. (E10a, W18g, 1-2; CI)

286-E. (German.) **Effect of Gas Scavenging Magnesium Consumption in the Production of Spheroidal Graphite Cast Iron.** Wilhelm Patterson. *Giesserei,* v. 44, Apr. 25, 1957, p. 216-227.

Mechanism of the scavenging effect; treating cast iron melts by gas scavenging; suppression of interfering elements; theory of the crystallization of spheroidal graphite.
(E22s, E25q; CI)

287-E. (German.) **Graphitization of Molten Cast Iron by Gas Scavenging.** George Blanc and Nicolas Volianik. *Giesserei,* v. 44, May 9, 1957, p. 277-290.

Theory of the method and results of small-scale experiments; advantages of graphitization by gas scavenging; applications and conclusions.
(E22s, E25q; CI)

288-E. (German.) **The Foundry in the Age of Automation.** Paul Schiegries. *Giesserei,* v. 44, June 6, 1957, p. 337-342.

Summary of the development of foundry facilities for molding and melting; prerequisites of automation; examples showing the use of automatic equipment in foundries.
(E general, 1-2, 18-24)

289-E. (German.) **Dust-Free Cleaning and Dressing.** Jules Kistler. *Giesserei-Praxis,* v. 75, Apr. 25, 1957, p. 159-167.

A review of the cleaning and dressing industry and new machines in use, with particular emphasis on dust control. 15 ref. (E24, A8a)

290-E. (German.) **Graphitization and Quality of Gray Cast Iron.** E. A. Hohmann. *Giesserei-Praxis,* v. 75, Apr. 25, 1957, p. 174-175.

Quality of gray cast iron is dependent on the factors (other elements present, overheating of the melt and speed of solidification) which influence graphite formation in the process. (E25n, E25q; CI-n)

291-E. (German.) **Testing and Evaluation of Bonding Materials for Foundry Sands.** Hans Reininger. *Giesserei-Praxis,* v. 75, Apr. 25, 1957, p. 176-181.

Influence of the bonding sand (its chemical and mineral composition, shape and size of individual grains), water content, nature of the bonder and blending of the bonder mixture. (E18n)

292-E. (German.) **Chill or Mask Casting in Foundries.** F. Paschke. *Giesserei-Praxis,* v. 75, May 25, 1957, p. 213-219.

Detailed account of the process from physical requirements of molds and materials used to mold preparation and variations in equipment available. (E19, E22q)

293-E. (German.) **Gates in Iron Casting.** *Giesserei-Praxis,* v. 75, May 25, 1957, p. 220-222.

The following characteristics determine shape, size and location of gates in casting: variation in wall thickness of mold, shape of piece cast, weight, core location and gas formation, dry or green sand mold, machining necessary. (E22p; CI)

294-E. (German.) **Working With Water Glass Containing Molding Sand, Without Carbon Dioxide Hardening, for Gray Cast Iron and Cast Steel.** Alfred Gebauer and Otto Gerstmann. *Giessereitechnik,* v. 3, Apr. 1957, p. 73-77.

Characteristics of water glass containing molding sands which harden without the presence of carbon dioxide; model can be removed from the mold which is still plastic; less danger of damage at corners and edges, less tapering necessary; pinning of square nails may be omitted.
(E18n; CI, ST, 5-10)

295-E. (German.) **Should a Mold Be Ventilated During Casting by Means of Risers.** Walter Göschel. *Giessereitechnik,* v. 3, Apr. 1957, p. 85-88.

Molds should be ventilated with covered risers if gases are permitted to escape in the direction of the risers by proper pouring technique and correct speed. (E22q)

296-E. (German.) **A New Molding Box With Minimum Backfilling.** Karl Bock. *Giessereitechnik,* v. 3, May 1957, p. 105-107.

New guide bushings and guide pins in the molding box result in technical improvements based on coarse and fine guides, whereby cylindrical, conical, round and oblong hole guides join for better results. (E19, 1-2)

297-E. (German.) **Results of Covering Risers.** Walter Göschel. *Giessereitechnik,* v. 3, May 1957, p. 111-113.

Fewer gas bubbles and scales appear in castings in which each riser is regularly covered. (E22q)

298-E. (Japanese.) **Effect of Vent Wire on Permeability of Molding Sands.** Kenji Hashimoto. *Casting Institute of Japan, Journal,* v. 29, Feb. 1957, p. 72-76.

In molding practice of small castings a vent wire is used to control the permeability of the sand. Its quantitative effect, however, is unknown. Presentation of fundamental data on the vent wire; experimental equations; conclusions. (E19)

299-E. (Japanese.) **Investigation of Sand Mold—Burning and Fusion on the**

Casting Surface. Goro Ohira and Mahito Koizumi. *Casting Institute of Japan, Journal,* v. 29, Feb. 1957, p. 76-87.

Siliceous and natural sand mold with some binders were applied for iron castings. It was noted that there were two kinds of burning, surface peel burning and lumpy burning. The former appeared in the castings in fine sand mold and often converted into fusion with less refractory sand, while the latter occurred in rather coarse sand connected with metal penetration. 12 ref. (E19)

300-E. (Japanese.) **Segregation in Castings.** Kazuo Yasuda and Kiichiro Amano. *Casting Institute of Japan, Journal,* v. 29, Feb. 1957, p. 97-103.

The determination of segregation was made by local spectrographic analysis on samples of 10% Sn-Cu alloy cast into green sand mold and on samples made of the same alloy treated with zirconium and cast into water-cooled metal and green sand molds respectively. Detailed analysis of results of these experiments. 3 ref. (E25n, Cu, *Sn,* 9-19)

301-E. (Japanese.) **Testing Method of Clay Content in Foundry Sand.** Jiro Kashima. *Casting Institute of Japan, Journal,* v. 29, Feb. 1957, p. 104-107.

The adsorption test was made by utilizing 1/10 *N* sulphuric acid solution containing nickel ions instead of using organic coloring matters heretofore employed. Satisfactory results were obtained on the relation between green strength of the sand and clay content. (E18r)

302-E. (Japanese.) **Heat Absorbency of the Mold and the Soundness of Castings. Report 2. On the Fundamental Characteristics of Various Chills.** Masataka Sugiyama, Morio Takahashi and Eisuke Niiyama. *Casting Institute of Japan, Journal,* v. 29, Feb. 1957, p. 108-116.

Heat-absorbing characteristics of various chills were quantitatively observed by temperature measuring method and their effects on the soundness of castings were discussed. Outline of results obtained. 4 ref. (E22r, P12k)

303-E. (Japanese.) **Study on High-Temperature Properties of Core Sand for Steel Castings.** Shizuya Maekawa and Hiroshi Akimoto. *Casting Institute of Japan, Journal,* v. 29, Mar. 1957, p. 163-170.

The relation between cracking of core sand and its strength at high temperatures. Under the same testing condition, natural silica sand shows higher hot strength and less cracking than the synthetic; sand having wide range of grain distribution and containing much moisture and clay has shown high hot strength and less mold cracks; bentonite bonded sand gives higher hot strength and less cracks than clay bonded; hot strength increase will reduce the degree of expansion and the occurrence of cracks. 8 ref. (E18r, 2-12; ST)

304-E. (Japanese.) **Studies on Crushing Properties of Foundry Sand. Report 1. On the Mechanism of Impact Crushing of Silica Sand.** Ryojiro Kono and Muneo Suzuki. *Casting Institute of Japan, Journal,* v. 29, Mar. 1957, p. 170-176.

Mikawa, Chikuma and Seto silica sands served as samples. The variation of grain distribution of each sand after impact force was checked. The impact mechanism of these sands did not agree with the law of Rittinger and Kick, but tallied with the Rosin-Rammler distribution formula. The grain shape of a silica sand does not vary by crushing until it becomes a single crystal, but as the grain is crushed further it gradually changes into angular type. 11 ref. (E18r)

305-E. (Japanese.) **Outlook on the Theories of Spheroidal Graphite Formation.** Takeomi Okumoto. *Casting Institute of Japan, Journal,* v. 29, Mar. 1957, p. 177-188.

Method of graphite growth, supersaturation theory, carbide decomposition theory, melt theory, nucleus theory, super-cool theory, surface energy theory, absorption theory, aggregation theory and dislocation theory. 55 ref. (E25n; CI-r)

306-E. (Swedish.) **Design of Thin Walled Gray Iron Castings.** T. Kappelin and G. Fernheden. *Gjuteriet,* v. 47, Apr. 1957, p. 57-60.

Thickness of casting, dimensional tolerances, pattern draft, fillets and openings for core prints and removal of the core. Closer cooperation on a fundamental level between engineers and foundrymen could simplify the machining of the castings and reduce the risk of shrinkage cavities. (E11, 17-1; CI-n)

F Primary Mechanical Working

100-F. Reducing Smudge on Cold Rolled Sheet. Michael A. Matz. *Iron and Steel Engineer,* v. 34, Apr. 1957, p. 105-106.

Control and reduction of smudge conditions is not dependent on any one specific condition; variations in hot rolling, pickling and annealing practices may all affect appearance of smudge. (F23, 1-16; ST, 4-3)

101-F. Designing Steel Shapes for Hot Extrusion and Cold Drawing. R. L. Hugo. *Machine Design,* v. 29, May 16, 1957, p. 127-130.

Design criteria for hot extrusion and cold drawing; cost data for the designer. (F24, G4, 17-1; ST)

102-F. Latest Techniques for Extruding Aluminum. Charles W. Wick. *Machinery,* v. 63, May 1957, p. 143-147.

Processes and equipment for melting, semicontinuous ingot casting, ingot inspection and heat treatment, sawing into billets, billet heating and extrusion, extrusion finishing, heat treating and submerged ultrasonic testing at Kaiser Aluminum Halethorpe Plant. (To be continued.) (F24, C5, J general, S13g; Al)

103-F. Development Problems in the German Drop-Forging Industry. O. Niederhoff and F. D. Schieferdecker. *Metal Treatment and Drop Forging,* v. 24, May 1957, p. 187-198.

Adaptation of automation to the drop forging industry is handicapped by the high temperatures involved. Ways and means of overcoming difficulties suggested. (F22n, 18-24)

104-F. Prevention of Flakes in Semifinished Steels. L. A. Narutskaya. *Henry Brutcher Translation* No. 3908, 2 p. (From *Stal',* v. 16, no. 12, 1956, p. 1097-1098.) Henry Brutcher, Altadena, Calif.

Current practice of cooling billets of carbon and alloy steel in unfired pits with capacities of about 300 m. tons; best temperature at which the stock should be charged into the pits; precautions taken in rail mills to prevent flake formation. (F21; ST, 9-20)

105-F. (French.) **Surface Qualities of Thin Cold Rolled Sheets.** *Trempe,* no. 33, Apr. 1957, p. 36-50.

Various operations involved—scouring, cleaning, rolling, annealing, skin passing, surface finishing. (F23, 1-17, L10, L12, J23; 4-3)

106-F. Tube-Forming. *Aircraft Production,* v. 19, May 1957, p. 174-179.

The production of the core-tubes for hollow steel airscrew blades as a multistage cold drawing operation from a precision turned billet. (F26r; ST)

107-F. Sprayed Lubricant Speeds Forging. *Modern Industrial Press,* v. 19, May 1957, p. 21-22.

Spraying hot die lubricant Thermex 33 between strokes resulted in longer die life and less scrap in hot press forging of roller rim from SAE 1045 steel. (F22; NM-h)

108-F. (French.) **Manufacture of Steel Wire and Wire Working. Pt. II. Steel Wire Working.** R. Ducharne and J. Moreau. *Pratique des Industries Mecaniques,* v. 40, Feb. 1957, p. 29-40.

Wire products have great variety of shapes, some of which require very complicated machinery to manufacture; such equipment cannot be described because it is in realm of manufacturing secrets. This article therefore deals with basic processes and methods of making wire products. (F28, G general)

109-F. Reheating of Steel Without Scale. A. G. Robiette. *Iron and Coal Trades Review,* v. 174, Apr. 19, 1957, p. 903-910.

Partial combustion of fuel gas with oxygen using products to preheat both air and charges; furnace design. (F21b, W20h, 1-2; ST, 9-2)

110-F. Automatic Processes in Strip Rolling. S. S. Carlisle. *Metal Industry,* v. 90, May 3, 1957, p. 350-354.

Recent research and development relating to automatic gage control with particular reference to system of control called "Translator", for use in hot and cold steel strip tandem mills and on single stand and tandem cold mills; while the "gagemeter" determines actual gage in roll gap from measurement of screw settings plus mill housing stretch, the "Translator" used in connection with "gagemeter" offers method of automatic control. (To be concluded.) 7 ref. (F23, 1-2, X20c; ST, 4-3)

111-F. Titanium Extrusions. A. M. Sabroff and P. D. Frost. *Modern Metals,* v. 13, June 1957, p. 50, 52, 54, 56, 58. (CMA)

Titanium extrusions were recently used in jet engines for such parts as nonrotating spacers, rings and flanges. It is estimated that the future aircraft requirement for extrusions will amount to 15-20% of the total titanium required. A tabulated summary is given of development work on the extrusion of several titanium alloys by 12 firms. Processes using glass were used by the majority, but grease and copper jacket processes were used by some. The basic extrusion method is forward extrusion in horizontal hydraulic presses. Short heavy-walled tubes may be back extruded in vertical hydraulic presses. The extrusion temperatures vary from 1500° F. (for Ti-2.2Fe-2.1Cr-2Mo) to 1900° F. (for Ti-5Al-2.5Sn). Various greases and glasses are considered. (F24, T24, 17-7; Ti)

112-F. Guide for Forging Stainless. W. E. McFee. *Steel,* v. 140, Apr. 15, 1957, p. 150-152.

Preheat and forging temperatures, soaking times and cooling methods for chromium-nickel, martensitic chromium and ferritic chromium steel forgings. (F22; SS)

113-F. Uranium Alloys: Their Preparation and Fabrication as Zircaloy-Clad Fuel Rods. W. B. Haynes. *U.S. Atomic Energy Commission,* WAPD-133, Jan. 10, 1956, 45 p. (CMA)

Among the alloys successfully duplex-melted were U-Mo and U-Mo-Pt. They were co-extruded in Zircaloy-2, cold drawn and swaged. Micrographs are shown for fuel rods before and after cold working. Alloys with 10.5-12% Mo are harder to extrude and draw than the analogous columbium alloys. A waterglass coat baked on the Zircaloy-2 reduces the alloying between the copper jacket and the Zircaloy cup during extrusion.
(F24, T11g, 17-7; U, *Mo, Zr,* 8-16)

114-F. Extrusion Techniques and Billet Design for the Production of Zircaloy-2 Clad Uranium-12 w/o Molybdenum Fuel Rods. J. G. Goodwin, et al. *U.S. Atomic Energy Commission,* WAPD-135. Jan. 10, 1956, 33 p. (CMA)

Fuel rods of 12% Mo-U alloy were prepared with Zircaloy-2 cladding. The fabrication of the extrusion billets is described. The best rods were prepared by heating the billets in a chloride salt bath at 1635° F. before extrusion. Dispersion of MoS_2 in Led-Plate is a good extrusion lubricant. The extruded rods were dejacketed, cold drawn and etched to size.
(F24, T11g, 17-7; U, *Mo, Zr,* 8-16)

115-F. Fabrication of Experimental U-Mo Fuel Rods by the Drawing of Co-Extruded Round Rods. H. J. Snyder. *U.S. Atomic Energy Commission,* WAPD-T-283, Oct. 13, 1955. 18 p. (CMA)

The fabrication of 12% Mo-U fuel rods with Zircaloy cladding is described. Co-extruded round rods may be either cold or hot drawn to reductions of 53 and 77% respectively. Better yields would result from proper tooling and longer rounds. MoS_2 in lacquer is a good lubricant for cold drawing and a mixture of sodium chloride and graphite in oil is good in hot drawing.
(F27, T11g, 17-7; U, *Mo, Zr,* 8-16)

116-F. (French.) **Technological Aspect of Shaping by Cold Deformation of Metal.** Raoul Molle. *Metallurgie et la Construction Mecanique,* v. 89, May 1957, p. 451-457.

Factors involved in the various methods of cold deformation of metal must be studied at the level of the crystalline network. Description of the various physical tests of the metal; special study of some deformation processes; cold shaping by rolling; sheet metal working. (To be continued.)
(F23, 1-16, G general)

Secondary Mechanical Working

Forming and Machining

220-G. Effect of Pressure Between Tool Tip and Workpiece on the Rate of Ultrasonic Machining in Ketos Tool Steel. Dieter Goetze. *Acoustical Society of America Journal,* v. 29, Apr. 1957, p. 426-431.

Ultrasonic machining rate in Ketos toolsteel obtained by using rectangular tool tips having different perimeters and circular tool tips having different radii. It is shown that the pressure rather than the force maintained between the tool tip and the workpiece is pertinent in the ultrasonic machining process, and that the ratio C/A of the tool tip perimeter C to the tool tip area A is of importance. A phenomenological expression is derived which for circular and rectangular tool tips relates the machining rate in general to the pressure in general.
(G24c; TS)

221-G. Stainless Steel. Pt. 1. Its Properties and Machining. J. A. Ferree. *Automatic Machining,* v. 18, May 1957, p. 61-64.

Properties of stainless steel of straight chromium and nickel-chromium grades and influence of properties and structure on the machining characteristics.
(G17, Q general; SS)

222-G. Automated Crankshaft Line at Plymouth. Henry Ibser. *Machine and Tool Blue Book,* v. 52, Apr. 1957, p. 109-115.

Machining of SAE 1045 steel crankshafts. Milling, turning and grinding machines are loaded and unloaded from transverse and longitudinal transfer units automatically after each machine completes its cycle. (G17, 18-24; CN)

223-G. Diamond Tools. Joseph Klipper. *Machine and Tool Blue Book,* v. 52, Apr. 1957, p. 130-140.

For machining nonferrous metals requiring low tolerances and high finishes diamond tools may be economical.
(G17, 1-2; EG-a, NM-k37)

224-G. Higher Rake Angles, Key to Better Performance in Milling. J. H. Crawford and M. Eugene Merchant. *Machine and Tool Blue Book,* v. 52, Apr. 1957, p. 142-149.

Study of cutter life and surface finish for hot rolled steel in face-milling and slab-milling operations with rake angle ranging from 0 to 50° and speeds of 70 to 500 surface ft. per min. (G17b; ST)

225-G. Operations on Body Components for Ford Consul, Zephyr and Zodiac Cars. *Machinery,* v. 90, Apr. 19, 1957, p. 852-861.

Equipment for drawing and piercing steel sheet to make automobile doors; press loading and extraction equipment.
(G2j, G4, 1-2, T21a; ST, 4-3)

226-G. Experiments on Grinding. P. Landberg. *Microtecnic,* v. 11, no. 1, 1957, p. 18-26.

Waviness of the circumference of wheel and work (micro-unroundness). Roughness of the work, wheel wear and grinding forces in their possible relation to the grinding vibrations and the life of the wheel. (G18; S21)

227-G. Study of the Influence of the Addition of Sulphur on the Machinability of a Medium-Carbon Steel. Paul Bastien and Michel Weisz. *Microtecnic,* v. 11, no. 1, 1957, p. 27-32.

Mechanism by which the addition of sulphur influences machinability is suggested. 6 ref.
(G17k, 1-10; CN, *S*)

228-G. Belt Grinding as a Precision Production Process. Alan G. Diamond. *Western Machinery and Steel World,* v. 48, Apr. 1957, p. 112-116.

Recent developments and equipment, recommendations as to abrasive grain size, belt speed and coolant for grinding various metals; application of process to grinding problem on circular stainless steel jet engine component. (G18k; SS)

229-G. Principles and Applications of Spark Machining. Pt. II. D. W. Rudorff. *Wire Industry,* v. 24, Apr. 1957, p. 353-356; disc. p. 360.

Equipment, factors controlling rate of material removal, scope of spark erosion technique, most important being the working of hardened steels in forming irregularly shaped apertures. (G24a; ST)

230-G. (French.) **Machining of Copper and Copper Alloys. Chapters II and III. General Practice of Machining.** (Continued.) *Cuivre Laitons Alliages,* no. 36, Mar-Apr. 1957, p. 7-14.

Cutting angles, types of cutting tools, choice of cutting speeds, cutting fluids, tool wear and tool life and surface finishing with special reference to copper, bronze and zinc. (To be continued.)
(G17, Cu, Zn)

231-G. (French.) **Ultrafinish, New High-Precision Grinding Process.** T. G. Lewis. *Machine Moderne et Revue Mecanique,* no. 579, June 1957, p. 41-48.

New method of grinding-polishing gives metal surfaces an exceptional polish and also an excellent geometric finish superior to that offered by every other commercial finishing process. (G19q)

232-G. (Japanese.) **Machining Technique in Germany.** Makoto Ito. *Society of Mechanical Engineers of Japan Journal,* v. 60, Apr. 1957, p. 372-380.

Machining practice in the German bearing and wheel industries; outline of research programs in machinery technique. (G17)

233-G. How to Machine Gray and Nodular Iron. Norman Zlatin, W. H. Friedlander and Charles F. Walton. *American Machinist,* v. 101, May 20, 1957, p. 137-152.

Practical guide to machining of cast irons dealing with sharpening of cutting tools, correct tool geometry, power requirements, relation of tool life to microstructure of cast irons, factors determining surface finish, problems of distortion, use of coolant and recommendations as to speed, feed and angle of cut.
(G17; CI-n, CI-r)

234-G. Why Abrasive Belts Need Grinding Fluids. J. J. Durnan. *American Machinist,* v. 101, May 20, 1957, p. 160-161.

Role played by fluids in carrying away heat, lubricating and preventing welding. (G18; NM-h)

235-G. Forces and Power Required to Turn Aluminum and Seven Alloys. O. W. Boston and W. W. Gilbert. *American Society of Mechanical Engineers Transactions,* v. 79, May 1957, p. 909-914.

Turning tests on pure aluminum 1100-H14 and seven aluminum alloys were made to develop the formula for the tangential cutting force as a function of the material constant, the feed in inches per revolution, and the depth of cut in inches, when cutting dry, with a solid high speed steel tool ground for turning aluminum. Equations for each metal have been developed and it is shown that the constants and exponents vary for each metal.
(G17a, 1-4; Al, TS-m)

236-G. Comparative Machinability of B1113, C1213, C1120 HR, C1120 CD and C1119 Steels. H. L. Bryden. *American Society of Mechanical Engineers Transactions,* v. 79, May 1957, p. 915-919.

A report on extensive machinability tests from which C1119 steel indicated an average tool life six times greater than that of the best B1113 and C1213 steels and nine times the tool life of the average of seven varieties of B1113 and C1213 steels investigated. (G17k; CN)

237-G. Acid Etch-Milling Is in Full-Scale Production. T. M. Rohan. *Iron Age,* v. 179, May 16, 1957, p. 114-115.

North American Aviation uses hydrochloric acid for chemical milling of complex shapes in aluminum tube, sheet and forgings. Chemical milling offers promise for shaping titanium and stainless steels. (G24b; Al, Ti, SS)

238-G. Tooling for Stainless on Automatics. W. E. McFee. *Machine and Tool Blue Book,* v. 52, June 1957, p. 99-114.

Types of stainless steels suitable for automatic screw machine work and chart of cutting rates; recommended feeds and tool compositions; characteristics of screw machine tools. (G17g, 1-2; SS)

239-G. Machining Stainless Steel at Ryan Aeronautical. Art Quinlan. *Modern Machine Shop,* v. 30, June 1957, p. 116-123.

Drilling, reaming, tapping, turning and milling stainless and other alloys. (G17; SS)

240-G. Automatic Plant Makes Aluminum Cans Faster, Cheaper. E. G. Maeder and A. V. Lovell. *Modern Metals,* v. 13, Apr. 1957, p. 36-40.

Transfer methods, equipment and plant layout used in German plant for impact extrusion and finishing of aluminum cans. (G5, 1-2, 18-17; Al)

241-G. Deep Drawing Simplified. Kim Darby. *Modern Metals,* v. 13, Apr. 1957, p. 54-58.

Flexible diaphragm replaces female die in Hydroform process to make simple or complex parts from aluminum, steel or other sheet metals. Method cuts tooling costs and set-up time, reduces thin-out, spot stresses, springback and wrinkling. (G14b, 1-2; Al, ST, 4-3)

242-G. Flame Cutting. H. T. Geertson. *New Zealand Engineering,* v. 12, Mar. 15, 1957, p. 107-109.

Process and its advantages. (G22g)

243-G. Cutting Costs With Impact Extrusion. *Steel,* v. 140, May 6, 1957, p. 85-88.

General principles of impact extrusion and illustrations of wide variety of parts from aluminum, silver, magnesium or other metals. Use of automatic slug casting machine. (G5; Al, Ag, Mg)

244-G. Contouring With Chemicals. *Steel,* v. 140, June 3, 1957, p. 85-88.

Although applications of chemical milling are almost entirely in aircraft and missile fields, it has potentialities in other industries. Basic steps, cleaning, masking, etching and stripping described. (G24b)

245-G. Case History in Production Machining Titanium. W. L. Carr. *Tooling and Production,* v. 23, June 1957, p. 83-85. (CMA)

The production machining of a titanium support for an aircraft engine mount is described. Good face milling is obtained with high-speed steel shell mills with 10° positive radial and axial rake or with carbide mills with neutral rakes. Cutters used in profiling are run at 500 sfpm. speed and 0.003-0.005 feed with a water-soluble coolant. Staggered tooth cutters are not used in thin-wall situation because of chatter. (G17b; Ti)

246-G. New Concepts in Deep Drawing Produce Molybdenum Anodes of Higher Reliability. J. M. White. *Tooling and Production,* v. 23, June 1957, p. 106, 110. (CMA)

Molybdenum anodes will overheat in thin sections when wall and end thickness is not uniform. There has been some difficulty in making a one-piece deep drawn part, the ideal anode shape. A new concept of deep drawing and more ductile molybdenum sheet has made the ideal possible. Aluminum bronze drawing dies are used; castor oil is the lubricant. (G4b, W3h, 17-7; Mo)

247-G. Explosive Forming Socks Tough Alloys in Shape to Thwart Thermal Thicket. *Western Metals,* v. 15, May 1957, p. 57-58.

Tests are underway at Lockheed Aircraft to examine possibilities of shock forming of high-tensile stainless steel and titanium alloys. (G general; SS, Ti, NM-k34)

248-G. (French.) **Cold Extrusion of Pieces. Mechanical Properties and Possibilities of Use.** H. D. Feldmann. *Machine Moderne et Revue Mecanique,* no. 579, June 1957, p. 57-66.

General principles underlying the cold extrusion of steel; mechanical properties of various steels; complementary treatments — machining, welding, protection against corrosion, hardening, practical examples. 11 ref. (G5; ST)

249-G. (Russian.) **Studying the Cutting Process With High-Speed Movie Camera.** S. P. Tambovtsev. *Stanki i Instrument,* v. 28, Feb. 1957, p. 19-21.

For studying the physical phenomenon of mechanical cutting with resulting chips and varying surface conditions suitable movie cameras are used. These generally expose 5000 frames per second and are capable of 360 X magnification; specimens are prepared by microgrinding the surfaces which are to be studied. (G17, X5h, 1-3)

250-G. (Russian.) **Improving the Dimensional Steadiness of Cutting Tools With Elastic Compensation.** M. A. Esterzon. *Stanki i Instrument,* v. 28, Feb. 1957, p. 24-28.

Decreasing of systematic errors appears to be the main problem in controlling dimensions in the cutting process. Compensations can be made by the number of operations or by time. Cutting force and the resulting deformation of the elastic system of the machine tool, cutters and parts may also be used. Examples are given. (G17, S14)

251-G. Processing 20-Mm. Shell Steel Belt Links to Precise Specifications. *Industrial Heating,* v. 24, Apr. 1957, p. 692-698.

Operations include forming, blanking, hardening in continuous furnace with controlled endothermic atmosphere, oil quenching, drawing furnace, cleaning and assembly of SAE 1055 steel belt links. (G general, J general, L12; Cr)

252-G. Titanium Deep Drawing Characteristics. *Light Metal Age,* v. 15, June 1957, p. 14-16. (CMA)

Research at Worcester Pressed Steel shows that deep drawing of titanium stampings has the advantages of speed, cheapness, close tolerances, strength and versatility of shape. The drawability of C-110M and A-110AT is compared with that of commercial titanium. There is a definite advantage in heating heavier gages to get draws equal to the cold draws on lighter gages. Curves for C-110M show that best results are obtained at 1000° F., where 50% draws are made at speed of 8-24 in. per min. Hydraulic presses give better results than mechanical presses. (G4b, 17-2; Ti)

253-G. Titanium—Fabrication Tips. *Light Metal Age,* v. 15, June 1957, p. 20-21. (CMA)

Fabrication methods for titanium used by Boeing Aircraft are reviewed. Conventional methods for aluminum may be used in the drilling, milling, stretch forming and spot welding of titanium. Hot forming titanium is often easier than cold forming aluminum; Meehanite dies and a ceramic lubricant are used. Uniform high temperatures and fast forming minimize distortion and contamination. Prior to heat treatment at 1700° F., Ti-4Al-4V is sprayed with aluminum silicone. A plastic enclosure for the argon is used in fusion welding. Riveting is easy. Bonding Ti-6Al-4V skins to 17-7PH honeycomb is discussed. (G general, K general; Ti)

254-G. Performance of Carbide Cutting Tools. *Machinery,* v. 90, Apr. 5, 1957, p. 743-747.

Study of carbide tools used for cutting AISI 1020 hot rolled steel. Lists equipment, test conditions, carbide wear and influence of chipbreakers on cutting forces, tool wear and cutting temperature. (G17; SGA-j, 6-19)

255-G. Ultra-Finishing Processes for Roll Surfaces. T. Q. Lewis. *Machinery,* v. 90, Apr. 19, 1957, p. 879-884.

Lapping techniques for providing optimum finish on roll surfaces. (G19p)

256-G. Cutting Tools Made of Ceramics. *Metal Progress,* v. 71, June 1957, p. 111-113.

Ceramic tool tips are usually made of cemented aluminum oxide, and are most valuable for uninterrupted finishing cuts on cast iron, and for machining hardened alloys or others unduly abrasive to carbide tools. Optimum tool geometry, developed by laboratory research, has been confirmed by production experience. (G17, T6n; SGA-j, 6-20).

257-G. Ceramics in Turning Defined by Research in Application and Use. *Metal Removing,* v. 1, Apr.-May 1957, p. 8-12.

Results of tests comparing carbide and ceramic tools for turning 4150 steel; suggestions for applications of ceramic tools; their proper design and use. (G17a; SGA-j, 6-20)

258-G. Martin Tests Ceramic Tools. *Metalworking Production,* v. 101, Apr. 5, 1957, p. 587-588.

Results of tests at Martin Co. using ceramic tools to cut and mill SAE 4130, SAE 4340, SAE 4340 and SAE 4335 with vanadium. (G17; SGA-j, 6-20, AY)

259-G. Tooling for Precision Presswork. J. Galway. *Metalworking Production,* v. 101, June 7, 1957, p. 967-975.

Multi-stage tooling of dieing presses reduces labor costs and results in cheaper and faster production. Cites examples. (G1)

260-G. Microfinish Gives Greater Economy. *Metalworking Production,* v. 101, June 14, 1957, p. 1019-1022.

Advantages of superfinishing technique; aspects of the process and details of Thielenhaus Microfinish continuous centerless machine. (G19q, 1-2)

261-G. Progress Report on Ceramics. Pt. 7. Why Ceramic Tools Can Cut Faster. Arthur G. Metcalfe. *Metalworking Production,* v. 101, June 14, 1957, p. 1023-1024.

Differences in tendency of chips to weld to tool tip are major reason why ceramic tools can operate at higher temperatures. (G17; SGA-j, 6-20)

262-G. New Flame-Cutting Machines in Shipbuilding. R. Bechtle. *Shipbuilder and Marine Engine-Builder,* v. 64, May 1957, p. 334-337.

Machines described are large and relatively heavy stationary types used for making straight cuts to prepare the edges for welding and for producing curved cuts. The first principle of construction is weight—adequate weight to afford stable and accurate operation for a long time, even under the most adverse conditions. The driving mechanism of the flame-cutting machine has to be designed with the severe working conditions prevailing in shipyards in mind. (G21g, 1-2)

263-G. What Makes a Good Deep Drawing Steel? *Steel,* v. 140, Apr. 22, 1957, p. 78-79.

General Motors' standards based on mechanical property rating, grain size and number of inclusions; surface classifications to be used in selecting cold rolled sheet for drawing. (G4b, 17-2, S22; ST)

264-G. Shot Peening. *Steel Processing and Conversion,* v. 43, May 1957, p. 260-266.

General principles and applications of shot peening. Table of S.A.E. standard shot numbers; information on air blast and centrifugal blast systems with their relative advantages; methods of shot reclamation and measurement of degree of intensity of peening. (G23n)

265-G. Thread Rolling Improves Part Quality—Cuts Production Costs. Clifford T. Appleton. *Tool Engineer,* v. 38, May 1957, p. 87-92.

Characteristics of thread rolling, methods and machines, thread rolling dies, preparation of blanks, preferred forms for rolling and various applications. (G12)

266-G. Applying Ceramics to Production. Alfred O. Haeme and Robert T. Hook. *Tool Engineer,* v. 38, May 1957, p. 100-104.

Data from production tests of ceramic tools for single point turning and the milling of steel parts. (G17a, G17b; SGA-j, 6-20)

267-G. Improved Cold Extrusion Sequence Reduces Material and Labor Costs. Hubert J. Pessl. *Tool Engineer,* v. 38, May 1957, p. 109-112.

Experimental work on cold extrusion of shells shows that diameter of billet need be no larger than diameter of finished product. (G5)

268-G. New Concepts in Deep Drawing Produce Molybdenum Anodes of Higher Reliability. James M. White. *Tooling and Production,* v. 23, June 1957, p. 106-110.

The electronic tube anode deep drawn from sheet molybdenum. Aluminum bronze drawing dies, castor oil lubricant and more ductile material are reasons for success. (G4b, 1-2, W3h, 17-7; Mo)

269-G. Designs of the Future With Chemical Milling. C. L. Hibert. *Western Machinery and Steel World,* v. 48, May 1957, p. 98-101.

General aspects and principles of metal removal by chemical milling; advantages in design of certain aluminum and titanium parts; specific applications and limitations of process. (G24b; Al, Ti)

270-G. Modified Skin Mills Precisely Sculpture Honeycomb Skin Panels. *Western Metals,* v. 15, Apr. 1957, p. 52-53.

Skin mills with especially equipped tables used for milling aluminum alloy sheets to be used as sandwich skin on jet plane components. (G17b, 1-2, T24a)

271-G. (English.) Analytical Study on Grinding Temperature. Kenji Sato. *Tohoku University, Technology Reports,* v. 21, 1957, p. 72-106, 255-290.

Proportion of heat conducted to the work. The chip and the wheel were studied experimentally and analytically in the case of SF-54 steel, grinding with an aluminum oxide wheel without coolant. Verification of analytical theory by temperature measurement and by work-wheel thermocouple method. 13 ref. (G18, S16)

272-G. (German.) Grinding of Hard Metals. Siegfried Buchner. *Metallwaren-Industries und Galvanotechnik,* v. 48, May 1957, p. 216-218.

Grinding wheels and abrasives are discussed with a tabulation of abrasives used in the various stages of grinding of specified materials. (G18; NM-j)

H Powder Metallurgy

51-H. (French.) Manufacture, Properties and Use of Electrical and Magnetic Materials Obtained by Sintering. M. Eudier. *Metallurgie et la Construction Mecanique,* v. 89, May 1957, p. 421-428.

This method of producing workpieces is most advantageous in the case of metals with a high melting point (tungsten, molybdenum) which would be costly to machine; it is also applicable to other mixtures of metals and other compounds; and is the best means of treating the very pure metals obtained by evaporation. Notes the various processes to be used, difficulties to be overcome and recommended methods. (H general; SGA-r, SGA-n)

52-H. Production of High Purity Uranium Powder. G. Bellamy and J. H. Buddery. *Nuclear Power,* v. 2, May 1957, p. 175-179.

Powder metallurgy can produce shapes in fissionable material to final size if the right type of powder is available. Glove box methods used at Harwell described. (H general, T11; U)

53-H. Thermal Etching of Titanium. P. Evans. *Acta Metallurgica,* v. 5, June 1957, p. 342-345. (CMA)

Thermal etching occurred in the sintering of titanium sheet rolled directly from powder. Pure argon was used in sintering from 8-21 hr. at 1400° C. The phase transformation resulting from furnace cooling rumpled the surface and obliterated all but grain-boundary etching. Etch terraces sometimes appear as curves, both smooth and polygonized. The polygonized etching is nearer the equilibrium configuration than the smooth curve but they differ only in degree. Growth mounds and large pits are present, but dislocation loops and inclusions were not apparent. (H15, N6; Ti)

54-H. Powder Metallurgy Process. *Precision Metal Molding,* v. 15, May 1957, p. 51-56.

Production of parts by compaction and sintering of metal powders indicating accuracy obtainable, advantages and limitations. Twenty examples of parts produced by powder metallurgy. (H general)

55-H. (Japanese.) Vacuum Hot Pressing of $MoSi_2$. R. Takagi and K. Tamura. *Japan Institute of Metals, Journal,* v. 21, Mar. 1957, p. 169-172. (CMA)

An experimental vacuum hot press for refractory materials is described and results of test with $MoSi_2$ are noted. The density, electrical resistivity, hot hardness, corrosion resistance, oxidation and thermal shock as well as hot modulus of rupture of the pressed specimen were measured. The temperature used was 1430° C. The properties measured were better than those produced from cold pressing and vacuum sintering. (H14h, 1-23; Mo, *Si*)

J Heat Treatment

131-J. Quench Hardening of Pure Gold as Observed by Internal Friction Methods. A. E. Roswell and A. S. Nowick. *Acta Metallurgica,* v. 5, Apr. 1957, p. 228-235.

Effect of heat treatment on the dislocation damping is studied in high-purity gold. Difference between quenched and furnace-cooled specimens observed and results interpreted. (J26, Q22; Au-a)

132-J. Induction Hardening of Automobile Rear Axles. P. Woodie. *Industrial Heating,* v. 24, Apr. 1957, p. 718-726, 730.

Equipment, procedure and advantages of induction hardening. Advantages are less distortion, fine grain structure, elimination of cleaning operation, automatic-type process, accurate and uniform hardening, ultimate strength obtained from carbon steel. (J2g, 1-2; CN)

133-J. Metallurgical Aspects in the Design and Operation of a Continuous Annealing Line. Pt. I. A. F. Mohri. *Industrial Heating,* v. 24, Apr. 1957, p. 740-750.

Experimental evaluation of influence on hardness of low-carbon steel strip, heating time, effective soaking time, cooling time, soaking temperature and quenching temperature; determination of influence of steel composition on hardness with different annealing cycles. (To be continued.) (J23, 1-11, Q29n, 1-2; ST)

134-J. Continuous Annealing Lines for Tinplate—Recent Trends and Problems. J. H. Hopper and A. Jakimovich. *Iron and Steel Engineer,* v. 34, Apr. 1957, p. 80-86.

Schematic layout of a typical continuous annealing line. Advantages are uniform product and higher strength, allowing thinner gage steel to be used with better corrosion resistance properties. 7 ref. (J23, 1-11; ST, *Sn*)

135-J. Stepped Austenitizing Treatment for 4340 Steel. E. P. Klier, Volker Weiss and George Sachs. *Journal of Metals*, v. 9, *AIME Translations*, v. 209, Apr. 1957, p. 424-425.

Note on hardenability and notched tensile properties after stepped or other austenitizing schedule. 6 ref. (J22, J5, Q27d; AY)

136-J. Flaking of Heavy Alloy Steel Section. C. R. Garr and A. R. Troiano. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, Apr. 1957, p. 445-449.

Investigates potential antiflaking heat treatment on 15-ton experimental heat of chromium-nickel-molybdenum steel produced in basic electric furnace with abnormally high hydrogen content; tested antiflaking isothermal heat treatment designed to produce completely pearlitic and completely bainitic microstructure; role of transformation stresses in flaking of steel sections. (J21; AY, 9-20)

137-J. Choosing the Right Quench. O. E. Cullen. *Steel*, v. 140, May 13, 1957, p. 123-126.

Commonly used steel quenching treatments and quenching media; suggestions for selecting quenching process, media and equipment. (J26, W28n, W28p, 1-2; ST)

138-J. Heat Treatment and Properties of the Uranium-5 w/o Zirconium Alloy. H. A. Saller, F. A. Rough and A. A. Bauer. *U.S. Atomic Energy Commission, BMI-915.* May 17, 1954. 28 p. (CMA)

Quenching the alloy from the gamma region gives a supersaturated alpha uranium. The reaction is martensite-like and gives a hard alloy difficult to fabricate. The stresses built up may cause warping and rupture. These effects may best be avoided by isothermal heat treatments which do not alter the corrosion resistance to boiling water. Varying the heat treatment gives a wide range of properties. (J26; U, *Zr*)

139-J. Depth of Sulphur-Enriched Zone Produced When Sulphidizing Steel and Cast Iron. G. V. Karpenko. *Henry Brutcher Translation* No. 3932, 2 p. (From *Vestnik Mashinostroeniya*, v. 37, no. 2, 1957, p. 61-62.) Henry Brutcher, Altadena, Calif.

Literature data on depth of sulphidized case on iron alloy and their discrepancies. Use of labeled sulphur atoms for determining actual depths of penetration of sulphur into steel and cast iron. (J4c; ST, CI, *S*)

140-J. (French.) **Tempering of Cast Irons.** *Fonderie*, no. 135, Apr. 1957, p. 170-180.

Optimum chemical compositions and operating precautions to be observed in this hardening process. Irons selected usually are without alloying elements or in the case of alloyed types contain nickel, chromium, molybdenum. Such irons have a homogeneous structure and the addition of alloying elements serves to facilitate tempering. (J29; CI-q)

141-J. (French.) **Oil Hardening.** M. Guillemeau. *Trempe*, no. 33, Apr. 1957, p. 9-19.

Critical speed of hardening and variables which influence the cooling rate—the cooling power peculiar to the oil, operating conditions and factors inherent in the piece; practical results. (J26n; W28p; ST, NM-h)

142-J. Induction Hardening for Long Shafts. George H. De Groat. *American Machinist*, v. 101, Apr. 8, 1957, p. 120-121.

Induction heaters used in hardening and drawing of SAE 1037 rear axle drive shafts. (J2g, 1-2; CN)

143-J. Double Heat Treatment Strengthens Cast Wheels. Larry DeBoer. *Iron Age*, v. 179, Apr. 18, 1957, p. 116-117.

Equipment for cleaning, heat treating to spheroidize structure and cooling of cast freight car wheels. (J23r, L12, 1-2; CI)

144-J. New Nitriding Process Uses Glow Discharge. P. M. Unterweiser. *Iron Age*, v. 179, May 2, 1957, p. 91-93.

Basic principles and advantages of nitriding process depending on passage of high-current electrical energy through steel parts in a nitrogen and hydrogen atmosphere. Nitrogen is ionized in glow discharge and atomic nitrogen diffuses into two parts. Diffusion into aluminum-containing steel appeared better than by conventional methods. (J28k; AY, *Al*)

145-J. To Slash Machining Costs Deep Freeze Your Castings. *Modern Metals*, v. 13, Apr. 1957, p. 64-65.

Heat treated aluminum castings chilled to −120° F. for two 4-hr. periods to increase dimensional stability prior to machining. (J26q, G17; Al, 5)

146-J. Atmosphere Control. Pt. 2. Wayne Besselman. *Steel*, v. 140, May 27, 1957, p. 96-97.

Recommendations in selecting systems for sampling and analyzing atmosphere for continuous control of heat treating process. (J2k; 1-2)

147-J. Controlled Atmospheres. Pt. 1. C. E. Peck. *Steel Processing and Conversion*, v. 43, Apr. 1957, p. 215-218, 222, 223, 225, 226.

Surveys types of controlled atmospheres and summarizes their commercial application in bright annealing of low-carbon steel, tinplate, high-carbon, alloy steels, toolsteels and alloy bar stock, silicon steels and stainless steels. Bright hardening of steels and gas carburizing. (To be continued.) (J2k, J28g; CN, AY, SS)

148-J. (Russian.) **Application of Gaseous Cementation in the Gorky Milling Machine Factory.** D. A. Schwartz and D. A. Zhadaeva. *Stanki i Instrument*, v. 28, Feb. 1957, p. 38-39.

Gaseous cementation, an advanced chemico-thermal process, is widely used in mass production, competing with carburization. The deciding factor is length of process and feasibility of mechanization. Kerosene is used as source of carbon in shaft furnaces. Parts are charged into the furnace in baskets, or on adaptors. Depth of carburization varies from 0.2 to 2 mm. and concentration of carbon in the affected surface from 0.23 to 0.97%. (J28g; CN)

149-J. (Russian.) **Application of Liquid Cementation for Machine Tool Parts.** E. M. Morozova and F. R. Florensova. *Stanki i Instrument*, v. 28, Feb. 1957, p. 40-41.

Cyanide is used often to carburize nuts, bolts and other parts. This, however, requires special precautions because of its poisonous character. Silicon carbide baths are simpler in application because no special conditions are required. The usual composition of the bath is 76-83% Na_2CO_3, 14-11% NaCl and 10-6% SiC. The last compound is the source of the carbon according to the formula: $2Na_2CO_3 + SiC \rightarrow Na_2SiO_3 + Na_2O + CO + C$. (J28g, T7)

150-J. Control of Exothermic and Endothermic Converters. W. H. Holcroft. *Industrial Heating*, v. 24, Apr. 1957, p. 676-688.

Factors influencing analysis of converted gas and the measurement and maintenance of proper analysis for the heat treating job at hand. (J2k)

151-J. Production Line Heat Treatment of Aluminum-Alloy Fin Blades. Charles A. Boz and W. E. Coon. *Industrial Heating*, v. 24, Apr. 1957, p. 702-708.

Layout and operation of continuous line solution heat treatment furnace, quenching tank and aging furnace for fin blades made of 14S aluminum. (J27a, W27, 1-2; Al)

152-J. Heat Treatment of Transmission Gears. David Brown's New Plant. *Metallurgia*, v. 55, May 1957, p. 232-234.

Gas carburizing line, salt bath line and induction hardening line of a gear and small parts manufacturer for both large and small jobs. (J28g, J2j, J2g, 1-2)

153-J. Steam Atmosphere Heat Treating Boosts Plant Operating Efficiency. F. L. Spangler. *Metal Treating*, v. 8, May-June 1957, p. 6-8.

Steam atmosphere heat treating produces oxide coating on iron and steel parts which protects parts against corrosion and gives superior wear resistance. Film is easily removed when further surface finishing is desired. Process is useful for annealing and stress-relieving brass, aging beryllium copper and solution treatment of aluminum; equipment for steam treating. (J2k, 1-2; RM-g32)

154-J. Tool Steels. Pt. 1. Basic Concepts Governing Their Treatment. L. F. Spencer. *Steel Processing and Conversion*, v. 43, May 1957, p. 253-259, 286.

Emphasizes hardenability and other fundamental characteristics of toolsteels. Notes on heating for forging, normalizing, annealing, hardening processes with quenching rates and media, tempering, martempering and specialized heat treatments. Common problems encountered are distortion, cracking, overheating and decarburization. 6 ref. (J general, F21b, J5; TS)

155-J. Controlled Atmospheres. A Survey of Their Types and Fields of Application in Metal Processing Operations. Pt. 2. C. E. Peck. *Steel Processing and Conversion*, v. 43, May 1957, p. 277-283, 285.

Discusses suitable atmospheres for bright annealing, bright hardening, tempering, carburizing, carbonitriding, sintering of powder compacts, brazing and soldering for most ferrous metals; lists atmospheres suitable for bright annealing or brazing of copper and copper alloys, aluminum and aluminum alloys, magnesium and magnesium alloys, nickel alloys and other nonferrous metals;

outlines furnace types for use with controlled atmosphere. (J2k, 1-2)

156-J. Some Thoughts on Spring Heat Treatment and Finishing. E. Mitchell. *Wire Industry,* v. 24, June 1957, p. 561-569.

Hardening and tempering, austempering, effects of good and bad heat treatment, requirements and choice of equipment, atmospheres, finishing, barrelling and blueing of small carbon steel springs, with emphasis on common errors and malpractice. (J26, J29, L10, L14; CN, SGA-b)

157-J. Effect of Various Heat Treatment Cycles Upon the Mechanical Properties of Titanium Alloys With Various Interstitial Levels. B. F. Hadley, G. W. Bauer and D. Evers. U.S. Air Force. Wright Air Development Center. Technical Report 56-580, *U.S. Office of Technical Services,* PB 131009, Mar. 1957, 220 p. (CMA)

Titanium alloy bars at five levels of interstitial content were studied for the effect of heat treatment on mechanical properties. The Ti-5Al complex and three other alloys were tested. The three types of heat treatment were (1) solution treatment and age cycle, (2) a step quench cycle and (3) a solution treatment, isothermal transformation cycle. Beta transi, TTT-curves and end-quench curves were determined for all samples, and 300-hr. creep tests were made on some. Data were obtained on high-temperature tensile properties, room-temperature notch strength and Charpy impact. (J7a, J6p, Q27a, Q6n; Ti)

158-J. (French.) **Experimental Study of Dissolved Gases and Water Temperature on Cooling Rate During Water Tempering of Metals.** Roland Bigot and René Faivre. *Comptes Rendus,* v. 244, Mar. 18, 1957, p. 1639-1641.

Quantitative study of influence of CO_2, N_2, O_2 and air. Examination of greater effectiveness of cold-water tempering over hot. (J29)

159-J. (German.) **Present State of Malleablizing Furnaces in Germany.** Reinhard Opitz. *Giesserei,* v. 44, June 6, 1957, p. 342-346.

Survey of conventional and modern malleablizing furnace plants in Germany; malleablizing times and heat consumption of furnace plants with annealing pots and packing materials; description of furnace plants for white-heart and black-heart malleable cast iron; metallurgical prerequisites for the annealing of black-heart malleable cast iron. 7 ref. (J23b, 1-2; CI-s)

160-J. (German.) **Use of Carburized Samples to Determine Fitness of Carburizing Materials.** Kurt Kallhardt. *Härterei-Technische Mitteilungen,* v. 10, no. 1, 1956, p. 39-53.

For selecting carburizing materials with a C value (carburization value) below the saturation point of steel, the C value in itself is usually the determining factor. If the saturation point of steel is above the C value of the carburizing material the activity of the carburizing material is the determining factor. 7 ref. (J28, 1-4)

161-J. (German.) **Insulating Materials for Case Hardening.** Paul Birk. *Härterei-Technische Mitteilungen,* v. 10, no. 3, 1956, p. 9-19.

Possibilities of partial case hardening; removal of hardening layer; copper coating; covering by plastic materials; coating with liquid materials; testing of usual insulating materials; suitable insulating materials. (J28n)

162-J. (German.) **Material and Heat Treatment for Gear Wheels.** Heinrich Staudinger. *Härterei-Technische Mitteilungen,* v. 10, no. 3, 1956, p. 21-38.

Choice of materials, stability and wear, surface hardening in relation to stability, residual stress, surface hardening processes, induction hardening as a suitable method, behavior of materials. 19 ref. (J28, J1, J2g, T7a)

163-J. (German.) **Alloyed Case Hardening Steels.** Waldemar Breuer. *Härterei-Technische Mitteilungen,* v. 11, no. 1, 1956, p. 9-24.

Problems encountered with regard to surface hardness, core stability, strength, hardenability, machinability and deformability of nickel, molybdenum and vanadium alloyed case hardened steels. (J28, Q general, J5, G17k, AY, *Ni, Mo, V*)

164-J. (German.) **Heat Treatment of Structural Steel for Increased Structural Strength.** Heinrich Staudinger. *Härterei-Technische Mitteilungen,* v. 11, no. 1, 1956, p. 25-48.

Origin and influence of residual stress; heat treatment to increase fatigue limits of small cross sections; heat treatment, residual stress and fatigue limits of large cross sections; local surface hardening and residual stress obtained by heat treatment; errors in heat treatment and its results on fatigue strength. 22 ref. (J general, Q25h, Q7a; ST, SGB-s)

K Assembling and Joining

257-K. Recommended Welded Connections for Pressure Vessels. *British Welding Journal,* v. 4, Apr. 1957, p. 174-180.

Recommendations for manually welding connections in carbon steel pressure vessels by metal-arc processes; from commission on pressure vessels, boilers and pipelines of the International Institute of Welding. (K1, T26q; CN)

258-K. Effect of Impurities in Argon on Inert-Gas Shielded-Arc Welds. R. A. Cresswell. *British Welding Journal,* v. 4, Apr. 1957, p. 181-188.

Investigates effect of presence of nitrogen, oxygen, hydrogen and water vapor in the argon for gas shielding in the arc welding of commonly used materials by both tungsten argon arc and consumable electrode processes. Materials welded were aluminum, aluminum-magnesium alloys, magnesium, copper, stainless and mild steel. 2 ref. (K1d, 3-19; Al, Mg, Cu, SS, CN)

259-K. Summary of Recent Work on the Murex Hot-Cracking Test. P. W. Jones. *British Welding Journal,* v. 4, Apr. 1957, p. 189-197.

Work aimed at finding best testing conditions assessing capabilities of Murex hot-crack machine and tests; results of test carried out with 24 different brands of electrodes in attempt to find factors promoting or mitigating hot-cracking. Notes on effect of sulphur. 2 ref. (K9r, W29h, 1-2)

260-K. Is Welding Ready for High Alloys. H. J. Nichols. *Canadian Metals,* v. 20, Apr. 1957, p. 36-38.

Problems and requirements in welding high-strength steels for fabrication of pressure vessels. (K general, T26q, 17-7; ST, SGA-a)

261-K. Magnesium Alloy Castings: Heat Treatment After Welding Repairs. K. Kronfeld. *Canadian Metalworking,* v. 20, May 1957, p. 54-61.

Test samples of unwelded AZ91 castings were compared with test pieces having approximately 20% of their cross-sectional areas occupied by an inert-gas welded deposit of identical composition. 33 ref. (K1d, J general, 18-22; Mg)

262-K. How to Silver Braze Powdered Metal Parts. *Industry and Welding,* v. 30, May 1957, p. 50-51.

Note on use of colloidal graphite to prepare sintered metal powdered parts for silver brazing. (K8; 6-22)

263-K. Shorthand of Welding. Clement F. Brown. *Industry and Welding,* v. 30, May 1957, p. 98-100.

Table of welding symbols for indicating simple butts and fillet welds on drawings. (K general, 17-1)

264-K. Basic Facts on Resistance Welding. P. M. Howard and D. Wilcox. *Industry and Welding,* v. 30, May 1957, p. 57-59, 113.

Theory of resistance welding and relation of weld defects to electrical resistivity; thermal conductivity of metal, weld pressure, current and time. (K3)

265-K. Strength of Silver Brazed Joints in Mild Steel. W. G. Moffatt and J. Wulff. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 442-445.

Experimental data for pure silver brazed joints in SAE 1020 steel indicate that for cylindrical test specimen with transverse joint ultimate tensile strength is linear function of joint thickness-to-diameter ratio. (K8, Q27a; CN)

266-K. How to Make Machinable Welds in Cast Iron. *Machinery,* v. 63, May 1957, p. 160-161.

Procedure for cleaning, joint preparation, preheating, welding, peening for stress reduction and post heating. Suggests use of nickel or nickel iron electrodes. (K9, K1; CI, 18-22)

267-K. Operations on Body Components for Ford Consul, Zephyr and Zodiac Cars. *Machinery,* v. 90, Apr. 26, 1957, p. 908-918.

Resistance welding equipment and operations used for assembling automobile doors. (K3, 1-2)

268-K. For Better Brazing Start With the Fundamentals. Lester F. Spencer. *Tooling and Production,* v. 23, May 1957, p. 99-103.

Defines brazing; gives data and examples on silver brazed joints comparing joint strength to strength of metals being joined; suggestions on cleaning, fluxing and heating for silver brazing. (K8; *Ag*)

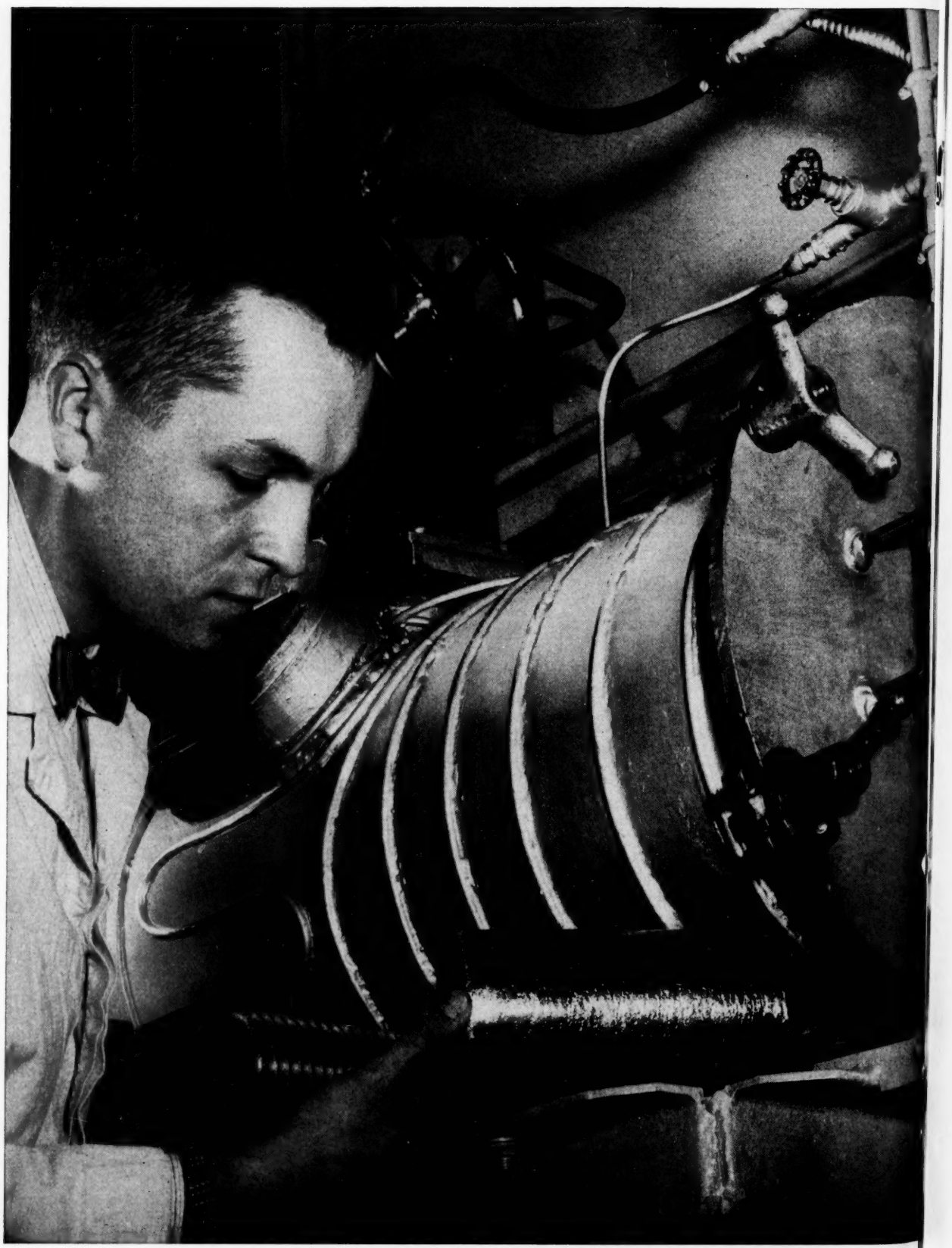
269-K. Teaching Welders How to Maintain Manganese Frogs. *Track and Structures,* v. 53, May 1957, p. 48-51.

The welding and care of manganese steel. (K general, A3h; AY, *Mn*)

270-K. Repair of a Cast Iron Machine Side-Frame. L. Miller. *Welding and Metal Fabrication,* v. 25, Apr. 1957, p. 131-132.

Procedure and precautions in the repair of a large cast iron frame by oxy-acetylene welding using cast iron filler rod. (K2h, 18-22; CI)

271-K. Nicrobraze Applied to the Napier "Eland" Gas Turbine. K. A.



F. G. Stengel, metallurgist at the Bettis Atomic Power Division, shown with the weld-conditioning box described on opposite page. He is examining the surface of a typical consumably-melted ingot prior to weld-conditioning.

METALLURGICAL PROCESS DEVELOPMENT

Weld-Conditioning of Reactive Metals for Nuclear Applications

This close-up shows ingots before and after new weld-conditioning process. Note the difference in surfaces.

A new weld-conditioning process for reactive metals used in nuclear applications has been developed in the metallurgical laboratories of the Bettis Atomic Power Division.

F. G. Stengel, Bettis metallurgist, first developed this process as part of a development program for the improvement of processes and techniques associated with fuel element fabrication problems. The process is designed to produce a sound and high-quality surface on ingots of materials used in reactor cores without sacrificing any appreciable amount of the expensive and critical alloys involved.

In this process, ingots of Zircaloy, hafnium, or uranium alloys are mounted inside a specially-designed weld-conditioning box. The apparatus must be vacuum-tight, because the materials being processed are highly reactive to the atmosphere. All of the driving mechanism (except the motor) is inside the box. Prior to weld-conditioning, the unit is evacuted and back-filled with helium or argon to slightly below atmospheric pressure. As the ingot rotates, a tungsten arc is struck against the ingot sidewall and the electrode traverses the length of the piece.

This remelts the surface of the ingot to a controlled depth, eliminating the porous, unsound peripheral layer and making it ready for immediate use to meet the demanding requirements of nuclear reactors.

Before this process was developed, the surfaces of these arc-melted or consumably-melted ingots were machined to remove this undesirable surface condition —or fabricated directly to strip and then conditioned in an attempt to improve the quality. These methods reduced yields and sacrificed up to ten per cent of the original ingot weight.

The weld-conditioning process as conceived by Mr. Stengel originally was applied to laboratory-size ingots weighing up to 30 pounds. But the process—including the size of the weld-conditioning box—has been expanded to include production-size Zircaloy ingots, weighing up to 1,000 pounds. Several of the commercial vendors who supply cladding material to Bettis use this same technique on the material they fabricate.

Mr. Stengel is a graduate of Massachusetts Institute of Technology, Class of 1952. He is presently assigned as a lead engineer to develop processes for the fabrication of fuel elements for a prototype reactor on the world's first atomic powered surface ship. And, like many of his associates, he is continuing his studies at the University of Pittsburgh, under the Westinghouse educational assistance program.

The weld-conditioning process described briefly on this page is only one of the many types of challenging projects which metallurgists encounter at Bettis—where you will find one of the highest concentrations of nuclear metallurgists in the country. If you are interested in working at Bettis with recognized leaders in the field of nuclear power, address your résumé to Mr. M. J. Downey, Bettis Atomic Power Division, Westinghouse Electric Corporation, Dept. A-181, Post Office Box 1468, Pittsburgh 30, Pennsylvania.

BETTIS ATOMIC POWER DIVISION

Westinghouse

Next Month—Metallurgical Materials Application—Application of More Economical Materials for Nuclear Power Plants

Peel. *Welding and Metal Fabrication*, v. 25, Apr. 1957, p. 137-143.

Atmosphere control and method of heating for brazing with Nicrobraze, a nickel-chromium-boron alloy. Data on mechanical properties for joints of steel or nickel alloys at high temperatures and after prolonged exposure at high temperatures; use of brazing procedure in fabrication of turbo-prop engine parts. (K8; ST, Ni, SGA-f)

272-K. Welded Aluminum Alloy Fishing Boat. *Welding and Metal Fabrication*, v. 25, Apr. 1957, p. 144-148.

Description of inert-gas, shielded metal-arc welding and tungsten argon-arc welding of aluminum fishing boat giving operational details on type of joint, current, gas flow and welding time. (K1d, T22; Al)

273-K. Resistance Types With Valuable Industrial History. Jack Fairlie. *Welding Engineer*, v. 42, May 1957, p. 37-38.

Note on welds achieved and equipment used for seam and for flash butt welding processes. (K3p, K3r, 1-2)

274-K. How to Estimate Electrode Consumption. *Welding Engineer*, v. 42, May 1957, p. 83.

Table for calculating weight of electrode consumed per linear ft. for all 90° welds. (K1, W29h, 1-2)

275-K. Strength of Brazed Joints in Copper Alloys. *Welding Journal*, v. 36, Apr. 1957, p. 177s-148s.

Room-temperature strength of lap and butt-type joints in copper alloys, brazed with various filler metals, is determined through laboratory investigation. 10 ref. (K8, Q27a; Cu)

276-K. Studies of Upset Variables in the Flash Welding of Steels. E. F. Nippes, W. F. Savage, G. Grotke and S. M. Robelotto. *Welding Journal*, v. 36, Apr. 1957, p. 192s-216s.

Influence of temperature gradient prior to upset, upset current density and composition of material on the upset behavior determined for three steels of differing elevated-temperature strength. (K3r; ST)

277-K. Application of Inert-Gas Tungsten-Arc Welding to Carbon-Steel Pipe. F. J. Pilia and R. W. Minga. *Welding Journal*, v. 36, Apr. 1957, p. 363-370.

New welding techniques and procedures, discussion of joint design, operator training and economics of application. (K1d; CN, 4-10)

278-K. Development of Methods for Sealing Ends of PWR Fuel Rods. J. J. Vagi and D. C. Martin. *U.S. Atomic Energy Commission*, BMI-942. Aug. 16, 1954. 30 p. (CMA)

Methods for sealing the ends of uranium (12% Mo) fuel rods clad with Zircaloy-2 were studied. Resistance upset welding is the most promising method for end capping, but gas porosity and shrinkage cavities remain a problem. Vacuum treatment helps porosity. Intergranular voids could be caused by either the welding or the polishing technique. Pressure bonding the end seals on a spot welding machine shows some promise. Flash welding and percussion welding were eliminated because the molten core is extruded. (K3, K5k, T11g, 17-7; U, Zr)

279-K. Automatic Argon Arc Welding of Stainless Steels With Consumable Electrodes in Various Positions. A. N. Akulov and N. Yu. Pal'chuk. *Henry Brutcher Translation* No. 3906, 3 p. (From *Svarochnoe Proizvodstvo*, no. 6, June 1956, p. 27-29.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 407-K, 1956. (K1; SS)

280-K. (French and German.) **Welding of Cast Iron.** Curt Elster. *Zeitschrift für Schweisstechnik*, v. 47, May 1957, p. 112-119.

Technical and economic possibilities of this little known process. Factors involved, methods employed, quality control and applications of "cold" arc welding. (To be continued.) (K1; CI)

281-K. Adhesive Bonding of Magnesium. R. J. E. Hunter. *Aircraft Production*, v. 19, May 1957, p. 198-201.

Process incorporating a corrosion resistant hot alkaline chromate treatment as the surface preparation, and intended for service at elevated temperatures. (K12; Mg)

282-K. How Grumman Welds Fusion to Non-Fusion Aluminum. John P. Wright. *American Machinist*, v. 101, June 3, 1957, p. 104-105.

Leading-edge wing tanks are resistance welded from fusion and nonfusion weldable aluminum through a method developed by Grumman Aircraft Engineering Corp. (K3; Al)

283-K. Dielectric Heat Cooks Metal Sandwiches. Don W. Cole. *American Machinist*, v. 101, Apr. 22, 1957, p. 153-156.

Possibilities and suggested setups for use of dielectric heat to cure plastic bonding materials in joining metal to metal assemblies. (K12, 16-11)

284-K. Three Cantor Lectures, Lecture II. H. G. Taylor. *British Petroleum Equipment News*, v. 5, Spring 1957, p. 68-75.

Deals with the welding of structural steelwork, bridges, tubular steelwork, pressure vessels, wind tunnels and excavators, and welding applications in the fields of atomic energy and oil refining. (To be concluded.) (K general, T26, T29n, T11)

285-K. Survey of Brazing Alloys Cured Production Headache. *Canadian Machinery*, v. 68, May 1957, p. 162.

Brazing four bronze components of different gage to form a vibration-resistant hose part. (K8; SGA-f)

286-K. Arc Welding Steel Castings. *Canadian Welder*, v. 48, May 1957, p. 6-8.

Preparation, thermal stresses, hot and cold cracking, porosity, suitable electrodes and post-weld treatments. (K1; ST, 5)

287-K. Welding Saves Steel. D. S. Desai. *Institution of Engineers (India) Journal*, v. 37, no. 7, Pt. 1, Mar. 1957, p. 695-705.

Savings of steel by means of welding are elimination of rivets, more compact joints, more freedom of design, reduces corrosion and eliminates overlapping joints. (K general, A11; ST)

288-K. Guide to Better High-Temperature Brazing. W. Feduska. *Iron Age*, v. 179, May 16, 1957, p. 116-118.

To be considered in choosing brazing alloy are melting temperature, wettability, oxidation and corrosion resistance; also important in obtaining sound joints are heating rate, atmosphere control, joint interface and surface. (K8; SGA-f)

289-K. How to Join Magnesium Alloys. *Modern Metals*, v. 13, Apr. 1957, p. 42-47.

Recommendations and information on weld characteristics of alloys; arc welding techniques; repair welding of castings; stress-relief heat treatment; spot, seam and flash washing; weld inspection; adhesive bonding and mechanical joining. (K general; Mg)

290-K. Corrugating Process Makes Flexible Cable Sheath. E. A. Farrell. *Modern Metals*, v. 13, Apr. 1957, p. 72-76.

Corrugated sheathing process developed and patented by German company, produces flexible aluminum sheath for electrical or communication cables which will take sharper bend and uses thinner gage metal. (K13a; Al)

291-K. Three Joining Methods for High-Temperature Sandwich Construction. A. A. Lanzara. *SAE Journal*, v. 65, May 1957, p. 62-64.

Brazing, adhesive bonding and resistance welding. (K8, K12, K3; 7-9)

292-K. How to Braze Aluminum. *Steel*, v. 140, Apr. 29, 1957, p. 164-167.

Lists brazable aluminum alloys, filler metals, flux and furnace dip, torch, induction and block brazing procedures, pretreatment for brazing aluminum to other metals. (K8; Al)

293-K. New Fusion Methods Ease Joining of Hard-to-Weld Materials. C. B. Robinson. *Western Metals*, v. 15, May 1957, p. 54-56.

Tungsten inert-gas arc welding, tungsten inert-gas spot welding, and metal inert-gas welding are among newer welding processes for joining of titanium, aluminum, copper, zirconium, stainless and other alloys with special joining problems. (K1d, K3n; Ti, Al, Cu, Zr, SS)

294-K. (German.) **Progress in Technology and Equipment of S.I.G.M.A. Welding.** E. Witting. *Aluminium*, v. 33, June 1957, p. 372-376.

General description of shielded-arc (S.I.G.M.A.) welding; special advantages and difficulties of shielded arc welding with consumable electrodes. Welding under a shield of pure argon containing 1% oxygen is quite a new means of improving weld quality and avoiding porosity. Description of automatic argon-arc cutting for preparation of edges for automatic S.I.G.M.A. welding. (K1d, G22h)

295-K. (Portuguese.) **Influence of Hydrogen in Voltaic Arc Welding. "Fish Eyes" and Hot Cracking.** Victor E. de Strasser. *ABM-Noticiario*, v. 11, Apr. 1957, p. 2-4.

Causes of imperfections and methods of preventing their appearance. (K1, g-22)

296-K. Japanese Process for CO_2 Shielded-Arc Welding of Steel. H. Sekiguchi and I. Masumoto. *British Welding Journal*, v. 4, May 1957, p. 205-212.

Tests show that welds made on rimming steel, semikilled or killed steels have good mechanical properties and low hydrogen content; process uses carbon dioxide or a carbon dioxide-oxygen mixture as a shielding gas with bare wire electrodes containing suitable quantities of deoxidants such as silicon, manganese and other elements; trial applications of process have begun in Japan. 6 ref. (K1d)

297-K. New Methods of Testing Weldability. M. K. Shorshorov. *Brit-*

ish Welding Journal, v. 4, May 1957, p. 239-243.

Three methods used in the USSR include a bead test to investigate changes caused by thermal cycle during welding and to establish best welding conditions; a method similar to Murex test for quantitative evaluation of hot cracking tendency; and a third method simulating weld thermal cycle in which samples are heated by electric current and artificially cooled enables the study of kinetics of grain growth and structural transformations — this technique was applied to several grades of carbon and low-alloy steels. 4 ref. (K9s, 1-4; CN, AY)

298-K. Solar Welds Electronically. Gordon Parks. *Industry and Welding,* v. 30, June 1957, p. 66-70.

Note on tungsten-arc argon-shielded, metal-arc argon-shielded, and other electronically controlled welding machines used at Solar Aircraft for automatic welding of aluminum and stainless steel airplane parts. (K1d, 1-2)

299-K. Brazing Helps Build Rockets and Missiles. G. Jewett Crites. *Industry and Welding,* v. 30, June 1957, p. 113-117.

Advantages of stainless steel honeycomb as structural material; retort, hot wall vacuum, cold wall vacuum, induction, electric blanket, blow torch, radiant lamp and salt bath brazing methods; their advantages and limitations in brazing honeycomb. (K8; 7-9)

300-K. Inert Gas Consumable Electrode Welding Process. D. B. Tait. *Metal Industry,* v. 90, May 3, 1957, p. 364-368.

Principles and development of process and its application in welding aluminum, copper, nickel alloys, stainless and mild steel. Properties of welds compared to those made by other processes. (K1d)

301-K. Regulated and Programmed Resistance-Welding Control Systems. C. Sinclair and F. S. Parker. *Welding Journal,* v. 36, May 1957, p. 463-465.

New current regulator for adjusting current on changes in impedance due to varying influence of magnetic material being welded can be programmed by a slope control to give regulated slope current wave, resulting in more accurate control over total heat delivered to weld during short weld times of spot or seam welding. (K3, W29c, 1-2)

302-K. Developed Procedures for the Flexible Electrode Submerged-Arc Welding Process. M. H. Fritsche. *Welding Journal,* v. 36, May 1957, p. 466-474.

Influence of fluxes and straight and reverse polarity on rate of weld metal deposition and mechanical properties; data on longitudinal and transverse shear strengths of fillet welds; comparison with other manual processes. 5 ref. (K1e, K9r)

303-K. Manual Magnetic Flux Gas-Shielded Arc Welding of Mild Steel. N. Davis and R. T. Telford. *Welding Journal,* v. 36, May 1957, p. 475-480.

Technique and equipment for manual arc process for all-position welding of mild steel; uses bare-steel welding wire, magnetic flux and carbon dioxide shielding gas. 4 ref. (K1d; CN)

304-K. Aspects of Crack Sensitivity in Machinable Deposits on Cast Iron. R. D. Wasserman, J. F. Quaas and J. P. Broderick. *Welding Journal,* v. 36, May 1957, p. 481-488.

Investigation of crack resistivity of welds made on cast test blocks, designed so that stresses cannot be dissipated; various nickel, iron-nickel and copper-weld metal ratios are explored; microstructure study and cross section hardness survey made of weld and cast iron base materials. (K9r; CI, 9-22)

305-K. Tip-Life Studies in the Spot Welding of 5052 Aluminum Alloy. Richard A. Davis and Robert C. McMaster. *Welding Journal,* v. 36, May 1957, p. 235s-239s.

Study of the effect of tip force on life and comparison of 4-in. and 10-in. radius dome electrodes. (K3n; Al)

306-K. Automatic Heliarc Speeds Seam Weld on Varied Size Stainless Pipe. Howard E. Jackson. *Western Metals,* v. 15, Apr. 1957, p. 66-67.

Forming and automatic arc welding of stainless steel tubing and pipe. (K1d; SS, 4-10)

307-K. (Danish.) **Automatic Submerged Arc Welding. Pt. I.** Bergstrand Poulsen. *Ingenioren,* v. 66, Jan. 26, 1957, p. 122-127.

Welding with continuous electrode feed. (K1e)

308-K. (German.) **Brazing of Pig Iron.** *Giesserei-Praxis,* v. 75, May 25, 1957, p. 222-223.

A practical discussion of brazing with emphasis on composition of fluxing material, flame temperature, oxygen supply and various other factors resulting in strong joints. (K8; CI-a)

309-K. (German.) **Light-Gage Sheet Steel Welding.** H. Verhoeven. *Industrie-Anzeiger,* v. 79, Mar. 12, 1957, p. 317-321.

Spot welding (single, double and multispot), projection, seam, butt and induction welding. 13 ref. (K3, K6n; ST, 4-3)

310-K. (German.) **Present Status of Welding With Heavy Duty Electrodes.** Herbert Neumann, *Oerlikon Schweissmitteilungen,* v. 15, no. 27, 1957, p. 8-22.

Development from contact to heavy-duty electrodes; means of achieving better welding results; necessity for sufficiently large sources of welding current for welding with iron electrodes. 4 ref. (K1, W29h, 1-2)

311-K. (German.) **Metallurgical Problems in Connection With the Development of New Welding Electrodes.** K. L. Zeyen. *Schweissen und Schneiden,* v. 9, May 1957, p. 186-193.

Range of application and economy of electric welding processes; new developments and present position of welding electrode metallurgy; basic electrodes; titanium-dioxide electrodes and electrodes with acid coatings; high performance electrodes; deep penetration electrodes. 37 ref. (K1, W29h, 1-2)

312-K. (German.) **Maintenance and Repair of Parts and Components by Means of Welding. Pt. II.** Herbert Neumann. *Schweissen und Schneiden,* v. 9, May 1957, p. 194-200.

Welding of joints for locomotive and ship boilers; welding, surfacing, flash-butt welding of drive and brake components, wheels, couplings, pipes; applications of various types of electrodes; welding of copper, Kuprodur, bronze; repair of castings; automatic welding processes. 4 ref. (K1, 18-21, 18-22; ST, Cu)

Cleaning Coating and Finishing

307-L. Surface Protection by Coating. *Australasian Manufacturer,* v. 41, Mar. 30, 1957, p. 76-82.

A ceramic coating affording thermal, erosion and electrical protection for metal and other surfaces is described. (L27)

308-L. Red Lead in the Protection of Iron and Steel. Pt. 4. H. Masseille. *Corrosion Prevention & Control,* v. 4, Mar. 1957, p. 37-39.

Durability of red lead linseed oil paints and their resistance to sea water; recommendations for surface preparation and application. (To be continued.) (L26n, R4b; ST)

309-L. Shotblasting Developments in Metal Surface Preparation. J. Carle. *Corrosion Prevention & Control,* v. 4, May 1957, p. 49-55.

Broad applications of shot blasting, including application to continuous steel strip, steel sheets, internal surfaces of ingot molds, welded fabrications, steel castings and gray iron castings. (L10c; ST, CI)

310-L. Roto-Finish Precision Barrelling. R. C. Liebman. *Corrosion Prevention & Control,* v. 4, May 1957, p. 59-61.

Processing equipment, economic and performance advantages. (L10d, 1-2)

311-L. Repair of Car Parts by Chromium Plating. A. W. Rykowa and W. Summer. *Corrosion Technology,* v. 4, Apr. 1957, p. 113-116.

Data from Russian source on the use of chromium plating for reducing wear and building up worn automobile parts. Results from microhardness, bending, tensile and wear tests on chromium plated steel specimens. (L17, Q9n; ST, Cr)

312-L. Metal Pre-Treatment by the Sodium Hydride Process. *Corrosion Technology,* v. 4, Apr. 1957, p. 128.

Note on sodium hydride descaling process; range of process applications and advantages. (L12n)

313-L. Vitreous Enamelling Brings Colour to the Home. *Industrial Finishing,* v. 9, Mar. 1957, p. 438-442.

Production of colored frit and its use in vitreous enameling of sheet iron for gas kitchen stoves. (L27, T10a, 17-7; Fe, 4-3)

314-L. Application of Nickel Plating. *Industrial Finishing,* v. 9, Mar. 1957, p. 443-450.

Relation of coating thickness and quality to current density and plating bath contamination; suggestions for obtaining desired thickness and maintaining bath purity; types of nickel plating baths and applications. (L17; Ni)

315-L. Avoiding De-Wetting of Tin Coatings. M. C. Chevalier. *Industrial Finishing,* v. 9, Mar. 1957, p. 460.

De-wetting defects occurring during tinning of steel by dipping are prevented by oxidizing the steel surface; methods of oxidizing include roasting at dull red heat, oxidation in air and nitric acid pickling. (L14a, L12g, L16; Sn)

316-L. Plant for Nickel Plating. *Industrial Finishing,* v. 9, Apr. 1957, p. 503-510.

Plant layout, type of equipment,

process variables and testing methods for thickness, ductility, corrosion resistance and adhesion. Physical properties of several commercially pure electrodeposited metals. (L17, 1-2, 18-17)

317-L. Finishing Spheroidal Graphite Iron Castings. *Industrial Finishing*, v. 9, Apr. 1957, p. 516.

Note on possibilities for finishing and coating spheroidal graphite iron castings. (L general; CI-r)

318-L. Organic Coatings for Die Castings. *Industrial Finishing*, v. 9, Apr. 1957, p. 523.

Types of finish available for diecastings and methods of application. (L26; 5-11)

319-L. Vacuum Metallising. Derek J. T. Kennedy. *Industrial Finishing*, v. 9, May 1957, p. 554-559.

Applications, principles of the process, including system of pumping and plant maintenance. (L23, 1-23)

320-L. Survey of Chromate Treatments. Walter E. Pocock. *Industrial Finishing*, v. 9, May 1957, p. 561-568.

Pretreatment, properties, application to zinc, cadmium, copper, aluminum and magnesium. (L14c; Zn, Cd, Cu, Al, Mg)

321-L. Alloy Plating: Which Way Is It Headed? F. A. Lowenheim and R. T. Gore. *Iron Age*, v. 179, Apr. 25, 1957, p. 112-113.

Current research in alloy plating field includes mention of tin-zinc, tin-cadmium, tin-nickel, tin-lead, tin-cobalt, tin-copper-zinc combinations and several non-tin alloys for which plating possibilities are being investigated. (L17; Sn)

322-L. Continuous Anodizing of Aluminum Wire for Insulation. G. E. A. Bramley and N. D. Pullen. *Light Metals*, v. 20, May 1957, p. 148.

History of development, applications and advantages over enameled copper wire. (L19, T1b; Al)

323-L. On the H.A.E. Process for the Protection of Magnesium-Rich Alloys. W. F. Higgins. *Light Metals*, v. 20, May 1957, p. 150-151.

HAE coating is not a general purpose palliative, but a special process to be used where the end justifies the cost. In United Kingdom the HAE treatment is slower to commend itself than in the United States. (L17; Mg)

324-L. Decorative Anodic Finishes. Peter Smith. *Light Metals*, v. 20, May 1957, p. 165.

Brief survey and application of types including natural (or silver) and colored finishes produced on aluminum and its alloys. (L19; Al)

325-L. Production and Properties of Opaque Coatings by Chromic Acid Anodizing. A. W. Brace and R. Peek. *Light Metals*, v. 20, May 1957, p. 166-167.

Effects on film thickness of anodizing voltage, electrolyte temperature and concentration. (L19p; Al)

326-L. Electroplating of Zinc Die Casting. Pt. 2. Ernest Horvick. *Metal Products Manufacturing*, v. 14, May 1957, p. 59-61.

In chromium, nickel and copper plating of zinc. (L17; Zn, *Cr, Ni, Cu*, 5-11)

327-L. Plating on Aluminum Bronze. I. William Marcovitch. *Plating*, v. 44, Apr. 1957, p. 387.

Note on cleaning and plating procedure for plating nickel on aluminum bronze. (L17, L12; Cu, *Al, Ni*)

328-L. Microthrowing Power. A Literature Search. Esther B. Leffler and Henry Leidheiser. *Plating*, v. 44, Apr. 1957, p. 388-396.

Section on definitions of terms; experimental work on microthrowing power and leveling; theoretical work concerned with deposition within isolated recesses and cavities. 46 ref. (L16b)

329-L. Electrolytic Cleaning and Descaling of Wire. R. Beck. *Wire Production*, v. 6, Mar. 1957, p. 5-7.

Advantages and disadvantages of a new process. (L13n; 4-11)

330-L. Protection of Uranium: Vapor-Deposited Coatings. I. E. Campbell, et al. *U.S. Atomic Energy Commission*, BMI-887, Nov. 24, 1953. 19 p. (CMA)

Satisfactory vapor-deposited coatings were obtained on uranium by a displacement-diffusion process (pack-zirconizing) using ZrI_2 and ZrI_3 vapors. A 24-hr. treatment at 1050° C. gave coats 5.9 mils thick which were adherent, nonporous and corrosion resistant to boiling water for 500 hr. The composition of the coat is uncertain. Molybdenum can be deposited from $Mo(CO)_6$. Deposits from VI_2 are anticipated. Work with ZrI_4 was abandoned. (L25; U)

331-L. Anodic Oxidation of Zirconium at Low Potentials: Effect of Electrolyte Composition. G. B. Adams, Jr., C. E. Borchers and P. Van Rysselberghe. *U.S. Atomic Energy Commission*, AECU-3432. Mar. 1, 1957. 21 p. (CMA)

Effect of electrolyte type and concentration on the unitary formation rate for the anodizing of zirconium at low potentials was studied. Apparatus and procedure described. The numerous electrolytes covered were alkali bromides, hydroxides, iodides, chlorides, chlorates, nitrates and sulphates, alkaline earth chlorides and nitrates, ammonium borate, acetate and hydroxide, tetramethyl ammonium bromide, and perchloric, nitric and acetic acids. The rates are given for each electrolyte and concentration. Variations in the unitary rate are not as definite for anions as for cations. Increasing electrolytic conductance always results in a decreased formation rate. The electrolyte should be presaturated with the metal oxide by high-temperature anodization. (L19; Zr)

332-L. Further Development of Phosphatizing to a Sludge-Free Process. F. Rossteutscher. *Henry Brutcher Translation* No. 3760, 3 p. (From *Mitteilungen f.d. Mitglieder d. Forschungsges. Blechverarbeitung*, no. 13, 1953, p. 1-3.) Henry Brutcher, Altadena, Calif.

Outline of currently used phosphate coating processes for ferrous metals; data on operating temperature, treating time and coating thicknesses produced; drawbacks resulting from sludge formation in bath; phosphate coating compared with oxalate coating; development of a process that operates at room temperature and without formation of sludge, giving a combination coating of ferrous oxalate and ferrous phosphate. (L14b)

333-L. On the Theory of Nitric-Acid Bright Pickling of Steel Sheet. G. von der Dunk. *Henry Brutcher Translation* No. 3829, 1 p. (From *Stahl und Eisen*, v. 76, no. 17, 1956, p. 1138.) Henry Brutcher, Altadena, Calif.

Critical review of literature on the bright pickling of steel in dilute nitric acid; particulars on chemical composition of residues left after pickling in various acids, with special reference to Petzold's work; preferential attack of nitric acid on grain junctions of steel. (L12g; ST, 4-3)

334-L. Black Spots in "Dry" Galvanizing. H. Bablik, F. Gotzl and E. Nell. *Henry Brutcher Translation* No. 3862, 2 p. (From *Metalloberflache*, v. 10, no. 2, 1956, p. 33-34.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 395-L, 1956. (L16; Zn)

335-L. (French.) **Work on Corrosion Undertaken by the British Iron and Steel Research Association. Pt. II. Study of the Means of Protection.** J. C. Hudson. *Corrosion et Anti-Corrosion*, v. 5, Apr. 1957, p. 119-127.

Great attention has been paid to protective coatings. Notes protection afforded against atmospheric corrosion by means of paints; analysis of anti-rust paints; influence of the thickness of the coating; influence of the conditions of application; correlation between corrosion and meteorological data such as relative humidity; protection provided by metallic coatings. (L general, A9)

336-L. (French.) **Metallization by Spraying in the Struggle Against Corrosion.** M. Cauchetier. *Corrosion et Anti-Corrosion*, v. 5, May 1957, p. 156-159.

Metallization by the Schoop process has always given interesting results for zinc, although much less so for other metals. Reviews the principal sprayed metals currently used in France as protective coatings in corrosion control and specifies thicknesses employed; cites a number of uses for metallized parts. (L23)

337-L. (French.) **Formation of Fish-scale in Enamel Coatings Applied on Steel Sheet. Its Relation to Certain Characteristics of the Base Metal.** Pierre Tyvaert and Roland Piva. *Fonderie*, no. 135, Apr. 1957, p. 153-160.

Experimental study comparing porcelain enamel sheets of varying thicknesses and composition. Analyzes effect of hydrogen, speed of attack, hardness and surface treatment in an attempt to determine the cause of this phenomenon. 9 ref. (L227, 9-2; ST, 4-3)

338-L. (French.) **Preparation Before Electroplating of Low-Carbon Steels.** *Galvano*, no. 243, Apr. 1957, p. 29-31.

Recommendations designed to facilitate the establishment of an appropriate cycle of cleaning operations prior to electrolytic treatment of low-carbon steels containing less than 0.35% carbon. Degreasing solutions, methods and equipment. Precautions to be taken to insure an unbroken cycle. (L12; CN)

339-L. (French.) **Choice, Control and Use of Bright Nickel Baths. (Continued.)** *Galvano*, no. 243, Apr. 1957, p. 38-41.

Methods and techniques designed to overcome occurrence of cracks and extremely fragile bright metal deposits. (To be continued.) (L17; Ni)

340-L. (French.) **Automatic Equipment for Electroplating Plants.** Karl

Gebauer. *Galvano,* no. 244, May 1957, p. 33-39.

Types of automatic systems currently in operation in France. Principles of construction and operation of automatic equipment; operating cycles; materials used in construction of tanks; transportation systems; heating systems; filters and pumps. Although automatic systems are based on American designs, modifications have been introduced in accord with European manufacturing conditions. ((L17, 1-3, 18-24)

341-L. (French.) Choice, Control and Use of Bright Nickel Baths. (Continued.) *Galvano,* no. 244, May 1957, p. 42-46.

Necessary equipment; points of technique involved in the cleaning of the base metal, solubility of the baths, neutralization of the formation of pits caused by the gas, treatment of passive nickel before chroming; inspection of the finished product for flaws; measurement of the thickness of deposits. 10 ref. (L17; Ni)

342-L. (French.) Detergents and the Cleaning of Metallic Parts. F. A. Scnitzler and A. T. Thibadeau. *Machine Moderne et Revue Mecanique,* no. 579, June 1957, p. 15-20.

Choice of cleaning product depends upon a number of factors including the method of application, nature of the metal to be cleaned, variety and amount of deposits to be removed. Methods of cleaning include submerging in tanks, electrolytic cleaning, agitation in a mixing drum, ultrasonic cleaning. Types of detergents and specific applications. (L10, L12, L13)

343-L. (French.) Use of Galvanizing Fluxes. A. Herz. *Metallurgie et la Construction Mecanique,* v. 89, May 1957, p. 463-464.

Essential characteristics of a galvanizing flux; its action on zinc baths; use of ammonium chloride, zinc chloride and fluorides; influence of the presence of water; saturation with oxides; use of the foams. (To be continued.) (L16; Zn, RM-q)

344-L. (French.) Reduction of Wear and Whiskers by Electrolytic Polishing. J. Heyes. *Metaux-Corrosion-Industries,* v. 32, Apr. 1957, p. 162-171.

Electrolytic polishing is especially useful in the case of gears in that wear and noise can be reduced by about one-seventh. Use of perchloric acetic anhydride baths. 5 ref. (L13p; T7a; ST)

345-L. (French.) Phosphatization of Ferrous Metals. J. Demesse. *Metaux-Corrosion-Industries,* v. 32, Apr. 1957, p. 172-175.

Different types of phosphate coatings for various purposes; zinc, manganese and iron phosphates; methods of treatment; physical and mechanical properties. 4 ref. (L14b; ST)

346-L. Deburring Improved, Cost Reduced by Blasting With Crushed Walnut Shell Pellets. Ben C. Brosheer, William D. Stampfli and W. Reece Baughn. *American Machinist,* v. 101, Apr. 22, 1957, p. 126-128.

Deburring operations on steel and die-cast aluminum parts with mechanical shell blaster units using crushed walnut shell pellets. (L10c; ST, Al, 5-11)

347-L. Coatings for Titanium. *Industrial Finishing,* v. 4, May 1957, p. 585. (CMA)

Two methods of producing surface conditions on titanium which minimize galling and seizing have been developed. An electrochemical anodizing process gives good coatings with a 5% NaOH solution at 205° F. and 50 amp. per sq. ft. for 20 min. An immersion coating process with a choice of one of three immersion baths is described. All contain fluorides and either phosphate or tetraborate. Immersion time has an important effect on the coating thickness and an optimum time is noted for each bath. The immersion coat is preferred to the anodized coat for economic and operational reasons. Both coats serve well in wire and tube drawing. (L19, L16, F26, F28; Ti, NM-h)

348-L. Painting and Graining Steel Folding Doors. Harold Lietz. *Industrial Finishing,* v. 33, May 1957, p. 20-28.

Cleaning, phosphating, drying, electrostatic painting, baking, power graining and application of final coat and bake processes in finishing of steel doors. (L26n; ST)

349-L. Cleaning and Treating Metals to Be Painted. P. C. Bardin. *Industrial Finishing,* v. 33, May 1957, p. 30-40.

Processes used in removal of soil from ferrous metals, aluminum, brass, bronze, copper and nickel and tin, include use of alkaline cleaners in multiple stage washers, phosphoric acid solution cleaning by power washing, brushing or dip tank, steam spray cleaning, degreasing with hydrocarbon solvents and solvent vapors, thermal degreasing. (To be continued.) (L12)

350-L. Chromium Plating of Gun Barrels. R. A. F. Hammond. *Institute of Metal Finishing, Bulletin,* v. 7, Spring 1957, p. 83-110.

Equipment, set-up, solution and operating conditions for electrochemical oversizing and polishing, de-smutting and chromium plating of medium-size (3 to 6-in.) gun barrels. (L17, L13, T2m, 17-7; ST, *Cr*)

35-L. Barrel Enamelling. W. S. Field. *Institute of Metal Finishing, Bulletin,* v. 7, Spring, 1957, p. 111-113.

Principles, advantages and limitations and applications in barrel enamelling of small metal parts. (L27)

352-L. Centrifugal Lacquering. J. G. Lemon. *Institute of Metal Finishing, Bulletin,* v. 7, Spring 1957, p. 114-118.

Features of centrifugal lacquering machines and their method of operation; suitable types of coating for metal articles such as nuts, springs, screws for which the method may be employed. (L26n, 1-2, T7)

353-L. Paint Parts First, Machine Later. A. A. Janis. *Iron Age,* v. 179, Apr. 18, 1957, p. 114-115.

Prime and finish coats of epoxy resin provide abrasive and perspiration resistant coating for parts during finish machining and in service. (L26n, G17)

354-L. Surface Treatment and Finishing of Light Metals. Pt. 13. Plated Aluminum-Tests, Corrosion, Applications. S. Wernick and R. Pinner. *Metal Finishing,* v. 55, June 1957, p. 79-84.

Specifications, applications, adhesion tests, corrosion resistance and mechanical properties. 15 ref. (L17, R general, Q general; Al)

355-L. Modern Chlorate-Accelerated Phosphating Bath. Edward Heinzelman. *Organic Finishing,* v. 18, May 1957, p. 8-11.

Mechanism of action of accelerators in phosphate coating baths. SAE 1010 cold rolled 20-gage steel sheet used for comparing phosphate coatings applied by spray or immersion containing chlorate or nitride accelerators; performance of coatings under impact, bend and corrosion rate tests. (L14b; ST, 4-3)

356-L. Electrostatic Painting in Russia. A. J. Steiger. *Organic Finishing,* v. 18, May 1957, p. 15, 16, 18.

Status of electrostatic spraying of metals in USSR; note on experimental and factory painting units, giving performance data. (L26n)

357-L. Production Painting of Metals. Royce A. Kelley. *Pacific Factory,* v. 87, Apr. 1957, p. 28-29.

Proper surface preparation and effective application of paint; procedures for centrifugal painting, electrostatic spraying, strip roller coating and flo-coating. (L26n)

358-L. Efficiency Up 30% With Electrostatic Painting of Meters. Carl M. Brehm. *Western Metals,* v. 15, May 1957, p. 52-53.

Welded meter assemblies sprayed automatically by electrostatic system eliminating paint wastage. (L26n)

359-L. Some Electrode Processes on Copper Anodes in Orthophosphoric Acid Solutions. K. F. Lorking. *Australian Aeronautical Research Laboratories,* Report A.R.L./Met. 18, Sept. 1956, 22 p.

Description and discussion of experiments showing the influence of increasing anode potential on surface finish and film formation on copper anodes in orthophosphoric acid. Theories of the mechanism of electropolishing are discussed and it is shown that modifications of these theories are indicated by the experimental observations. 26 ref. (L13p; Cu)

360-L. Vacuum-Deposited Films of Nickel-Chromium Alloy. R. H. Alderson and F. Ashworth. *British Journal of Applied Physics,* v. 8, May 1957, p. 205-210.

Preparation and properties of stable films of vacuum-deposited nickel-chromium alloy. Properties discussed include the film-alloy composition, the relationship between film thickness and resistance, the temperature coefficient of resistance, grain size in the film (electron micrographs), mechanical failure of stressed films, optical transmission as a function of film thickness, fundamental noise and electrical breakdown under low and high frequency conditions. Graphs summarize the data and micrographs illustrate grain growth, breakdown due to stresses in the film and electrical breakdown in microwave attenuators. (L25g, N3; Ni, Cr, 14-12)

361-L. Throwing Index. A New Graphical Method for Expressing Results of Throwing-Power Measurements. Robert V. Jelinek and Hero F. David. *Electrochemical Society, Journal,* v. 104, May 1957, p. 279-281.

Method for expressing correctly the results of throwing power measurements made on plating solutions in conventional throwing power box. The metal distribution ratio (M) is plotted against the linear ratio (P) on arithmetic coordinates. The throwing power index is given by the reciprocal of the slope of this plot. (L17b)

362-L. Tin Plating From the Pyrophosphate Bath. J. Vaid and T. L. Rama Char. *Electrochemical Society, Journal,* v. 104, May 1957, p. 282-287.

Electrochemistry of solutions containing tin pyrophosphate complex; optimum operating condition for satisfactory deposition; effect of addition agents on current efficiency and quality of deposits; comparison of performance to that of stannate bath. 19 ref. (L17b; Sn)

363-L. Inclusion of Fuchsin in Bright Nickel Deposits. J. L. Dye and O. J. Klingenmaier. *Galvanic Corrosion,* v. 104, May 1957, p. 275-279.

Study of effect of fuchsin concentration and current density on amount of brightener included in the deposit during nickel plating; summarizes several chemical and physical properties of fuchsin and suggests possible mode of action as a brightener. (L17a; Ni)

364-L. Inhibitors in Acid Pickling. *Industrial Finishing,* v. 9, Mar. 1957, p. 452-454.

Investigation of 18 inhibitors used to reduce acid attack on steel during pickling and their effect on acid brittleness in 0.58% carbon steel wire pickled in sulphuric acid. (L12g; CN, 4-11)

365-L. Standardizing Surfacing Materials. W. L. Lutes and H. F. Reid. *Industry and Welding,* v. 30, June 1957, p. 73-78.

Need for standardization and classification system for surfacing materials for coating by weld deposition; note on AWS-ASTM specification and suggestions designated. 7 ref. (L24, S22)

366-L. Nature of Mechanically Polished Metal Surfaces. Deformation Produced During Abrasion of 18-8 Type Austentic Steel. L. E. Samuels and G. R. Wallwork. *Iron and Steel Institute, Journal,* v. 186, June 1957, p. 211-218.

Structure of deformed surface layer investigated by metallographic taper-sectioning technique. Depth of layer produced by various methods of abrasion was studied systematically and optimum conditions of abrasion established. Requirements of mechanical methods for polishing necessary for production of surface free from gross deformations are considered. Results are essentially in agreement with those of earlier study using specimens of 70-30 brass. 19 ref. (L10, S15; SS)

367-L. Almco Supersheen Barrel-Finishing Process. *Machinery,* v. 90, Apr. 19, 1957, p. 867-874.

Size range in barrel finishing machines, barrelling media, record keeping and numerous examples of barrel finishing techniques applied to aluminum, steel, brass, copper and other components. (L10d, W2s, 1-2; Al, ST, Cu)

368-L. Polyamide Protective Coatings. Don E. Floyd. *Materials and Methods,* v. 45, May 1957, p. 136-144.

Properties of polyamide epoxy, polyamide phenolic and other polyamide coatings and their use for protecting metals from abrasion, heat, water, grease, acid and alkalies. (L26p)

369-L. Which Organic Coating? Howard R. Rothenberg. *Materials & Methods,* v. 45, June 1957, p. 102-106.

Working guide giving performance and cost factors for use in selecting proper organic finish for metals surfaces. (L26, 17-2, 17-3)

370-L. Automatic Control in Electroplating. J. W. Cuthbertson and J. E. Parton. *Metal Industry,* v. 90, May 3, 1957, p. 355-359.

General principles and types of control; complications and variables in automatic plating operations. (L17, 18-24)

371-L. How to Clean and Etch Aluminum. D. Gardner Foulke and O. Kendle Irgens. *Modern Metals,* v. 13, May 1957, p. 44-48.

Removal of surface contaminants from aluminum with the use of solvent cleaners, emulsion cleaners, deoxidizers or alkaline cleaners; problems in the use of acid and alkaline etchants; prevention of sludge; control of etching rate and use of conversion coatings. (L12, L14; Al)

372-L. How to Choose Heat Tolerant Coatings. *Steel,* v. 140, Apr. 22, 1957, p. 82-84.

Oxidation and corrosion resistance, thermal stability, coefficient of thermal expansion, tendency to diffuse with base metal and other properties affecting use of chromium, molybdenum, rhenium, tungsten, titanium, cobalt, tantalum and zircon and borides and silicides as protective coating for high-temperature use. (L general, R general; SGA-h, 8)

373-L. Surface Characteristics of Tinplate. W. E. Hoare. *Tin and Its Uses,* no. 39, Summer 1957, p. 9-11.

Nature and value of naturally occurring air formed on oxide films; artificial films produced by chemical or electrochemical means; oil films obtained during production of tinplate or added later to tinplated steel. (L14, L16; St, *Sn*)

374-L. Fundamentals of Barrel Finishing. Pt. 2. How to Get Started. T. W. Black. *Tool Engineer,* v. 38, May 1957, p. 113-120.

Suggestion for setting up a barrel finishing job. Includes note on protecting delicate parts, record keeping, finishing variables and number of operations. (L10d)

375-L. Survey of the Literature on the Electrodeposition of Molybdenum. T. T. Campbell and A. Jones. Bureau of Mines, Information Circular 7723, *U.S. Office of Technical Services,* PB 124152, July 1955. 8 p. (CMA)

An extensive bibliography of periodical literature and research reports relating to the electrodeposition of molybdenum. (L17; Mo, 11-15)

376-L. (English.) Electrolytic Surface Phenomenon and Its Application in Precision Engineering. Masao Naruse and Akira Nannichi. *Tohoku University, Technology Reports,* v. 21, no. 2, 1957, p. 63-69.

While conducting a fundamental experiment it was noticed that in electrolytic polishing process the surface of the anode which was to be polished gave, in the neighborhood of the liquid line, a polish phenomenon different from the polishing condition in the electrolyte, which we call the "electrolytic surface phenomenon". (L13p)

377-L. (French.) Phosphatizing as an Aid to Cold Deformation of Metals, Particularly Wiredrawing. P. Orlowski. *Pratique des Industries Mecaniques,* v. 40, Mar. 1957, p. 66-67.

Advantages of phosphate pretreatment; practical examples. (L14b, F28; NM-h)

378-L. (German.) Anodic Oxidation of Titanium. Horst Böhm. *Metalloberfläche,* v. 11, June 1957, p. 197-200.

Current-density-time curves, current-time curve with sudden voltage drop and corrosion tests show wear and corrosion resistance of anodically oxidized titanium. 10 ref. (L19, Q9n, R general; Ti)

379-L. (German.) Ultrasonics in Electroplating. Albert Roll. *Metallwaren-Industrie und Galvanotechnik,* v. 48, May 1957, p. 194-204.

An ultrasonic generator; influence of ultrasonics on electrochemical proceedings; ultrasonics and hydrogen liberation; agitator effect of ultrasonics; influence of ultrasonics on surface. 2 ref. (L17, 1-24)

380-L. (German.) Testing of Galvanic Baths (Nickel and Chromium). W. Garhöfer. *Metallwaren-Industrie und Galvanotechnik,* v. 48, May 1957, p. 205-206.

Determination of metal contents, metal impurities and sulphuric acid in the plating bath; details on the necessary operations. (L17a)

381-L. (German.) Filtration in Electroplating. Pt. V. Filtering Devices. Erich Stöcker. *Metallwaren-Industrie und Galvanotechnik,* v. 48, May 1957, p. 207-214.

In addition to listing equipment, media and filter aids available, tabulates advantageous methods of filtration for different types of baths (nickel, cadmium, manganese, etc.). 30 ref. (L17, 1-2)

382-L. (German.) Metal Dyeing. Rolf Hoeltgen. *Metallwaren-Industrie und Galvanotechnik,* v. 48, May 1957, p. 214-215.

Processes for dyeing iron and steel black-brown, black (Schweizer matt) and blue. (L14)

383-L. (German.) Influence of Surface Treatment on the Mechanical Properties of Tungsten. K. Sedalatschek and D. A. Thomas. *Planseeberichte für*

DUCTILE CHROMIUM

is possible!

A new book called DUCTILE CHROMIUM is available . . . NOW!!

Sponsored by U. S. Army Ordnance and written by 45 technical experts

$7.50—*RED CLOTH*

376 Pages—6 x 9

27 CHAPTERS ON—

1. **General Review . . .**
2. **Production of Chromium Metal . . .**
3. **Ductile Chromium Metal . . .**
4. **Effect of Gas on Chromium Metal . . .**
5. **High-Chromium Alloys . . .**

AMERICAN SOCIETY FOR METALS
7301 Euclid Ave.
Cleveland 3, Ohio

Name _____

Company _____

Address _____

City _____ **Zone** _____ **State** _____

Check or Money Order Enclosed _____,

Bill Me _____, **for** _____ **copies Ductile Chromium.**

Pulvermetallurgie, v. 5, Apr. 1957, p. 27-32.

Mechanical properties can be improved by removal of surface layers through electrolytic polishing. Measurement of transverse strength indicates no appreciable improvement by removing greater amount of surface layer above 20 μ. Tensile and elongation tests indicate more favorable mechanical properties by greater removal of surface layer. 5 ref. (L13p, Q27a; W)

384-L. (Japanese.) **Chemical Polishing of Titanium Alloys.** S. Okamoto. *Government Mechanical Laboratory, Journal*, v. 11, May 1957, p. 84-86. (CMA)

A study of the chemical polishing of titanium alloys in sulphuric acid shows the best results are obtained when the acid is boiling, the concentration is 80-90% and the polishing time is 10-30 min. The alloys applicable are Ti-Cr-Mo, Ti-Ni, Ti-Cr, Ti-Ag, Ti-Mn, Ti-Fe, Ti-Mo, Ti-Cu, Ti-Co, and Ti-Mo-Al. (L12g; Ti)

Metallography

Constitution and Primary Structures

203-M. Quenching-In of Lattice Defects in Gold-Cadmium. M. S. Wechsler. *Acta Metallurgica*, v. 5, Mar. 1957, p. 150-158.

Amount of quenched-in resistivity was measured as a function of quench temperature. Isothermal annealing of the quenched-in-resistivity was studied at a number of temperatures. Possible explanations of defect responsible for changes in resistivity are discussed. 28 ref. (M26s, J26, J23s; Au, Cd)

204-M. X-Ray Diffraction Studies on Precipitates and Inclusions in Steels Using an Extraction Replica Technique. G. R. Booker, P. J. Norbury and A. L. Sutton. *British Journal of Applied Physics*, v. 8, Apr. 1957, p. 155-157.

A simple extraction method in which precipitates and inclusions in steels can be isolated for identification by X-ray diffraction. The included material is removed from the metal surface embedded in a thin plastic replica, which is then formed into a small, compact, cylindrical specimen suitable for powder cameras. Scope of the method, examples of its application. 3 ref. (M22g, 1-3; ST, 9-19)

205-M. Lattice Spacings of Nickel Solid Solutions. W. B. Pearson and L. T. Thompson. *Canadian Journal of Physics*, v. 35, Apr. 1957, p. 349-357.

New lattice spacing measurements in terminal nickel solid solutions with Cr, Mn, Co, Zn, Ga, Ge, In and Sn solutes are reported and discussed, and the relationship of lattice distortion and the depression of the solidus temperature is examined in solid solutions of the first long period elements in nickel. 21 ref. (M26p; Ni)

206-M. Lattice Distortion in Terminal Solid Solutions of the First Long Period Transition Metals and Copper. W. B. Pearson. *Canadian Journal of Physics*, v. 35, Apr. 1957, p. 350-362.

Collected data of the gross lattice distortion in solid solutions of the first long period elements in each other and in copper, together with similar data for B group solutes in copper, silver and gold. It is shown that there is no correlation between the size of the lattice distortion and the solid solubility of the first long period transition metals in copper. 7 ref. (M26p; Cu)

207-M. Lattice Dynamics of Hexagonal Close-Packed Metals. L. J. Slutsky and C. W. Garland. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 787-793.

Atomic force constants are related to the elastic constants by the method of homogeneous deformation in which the contribution of the electron gas to the elastic constants is assumed to arise from an isotropic volume-dependent term in the energy. Relations are given for the propagation of acoustical waves in hexagonal crystals which permit calculation of the elastic constants from ultrasonic pulse velocity measurements. (M26, Q21)

208-M. Uranium-Lead System. Robert J. Teitel. *Journal of the Institute of Metals*, v. 85, May 1957, p. 409-412.

New data on the solubility of uranium in lead, obtained by filtration technique, and on the crystal structure of UPb, obtained by neutron diffraction. Uranium-lead phase diagram included. (M24b; U, Pb)

209-M. Lattice Parameters of the Alpha Solid Solutions of Copper-Zinc-Germanium and Copper-Zinc-Gallium Alloys. B. B. Argent and D. W. Wakeman. *Journal of the Institute of Metals*, v. 85, May 1957, p. 413-414.

Investigation to determine whether anomalies exist in lattice parameters of ternary systems as have been reported for binary systems. It was found that expansion of copper lattice may be expressed approximately as the sum of the expansion due to each of the solutes considered individually. 11 ref. (M24c, M26; Cu, *Zn, Ge, Ga*)

210-M. Electron Probe Microanalyzer and Its Application to Ferrous Metallurgy. R. Castaing, J. Philibert and C. Crussard. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, Apr. 1957, p. 389-394.

Apparatus employing electron optical system focuses very fine electron beam on specimen; analyzes X-radiation with curved crystal Geiger-Müller counter vacuum spectrograph. Report on preliminary trials with instrument on segregation of manganese, selective oxidation during scaling, internal oxidation, phases of sulphides occurring in several iron and steel alloys; diffusion studies of uranium-zirconium and iron-copper alloys. 11 ref. (M21e, 1-2, M27, R2q, R2s, N1)

211-M. Central Region of the Magnesium-Zinc Phase Diagram. J. B. Clark and F. N. Rhines. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, Apr. 1957, p. 425-430.

X-ray diffraction and metallographic study of phase equilibria in the magnesium-zinc phase system from 0 to 85% zinc between 93 and 335° C. Revised diagram indicates magnesium-zinc phase is stable over temperature range studied. Temperature of eutectoid decomposition of Mg_2Zn_3 near 325° C. (M24b; Mg, Zn)

212-M. Electron Diffraction Study of Flake Graphite Extracted From Molten Pig Iron. Kichizo Niwa and Goro Shimaoka. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, Apr. 1957, p. 430-434.

Study by electron diffraction transmission characteristics of single graphite flakes, segregated from molten carbon or silicon-rich iron at 1200 to 1500 °C. (M22h; CI-a)

213-M. Modern Metallographic Equipment. J. C. Wright. *Metal Treatment and Drop Forging*, v. 24, May 1957, p. 175-180.

Advantages and disadvantages of various techniques and equipment for specimen preparation and examination. (To be continued.) (M10, 1-2)

214-M. X-Ray Investigation of the Deformation and Bond Strength in the Crystal Lattice of Metals and Alloys. G. V. Kurdyumov, V. A. IL'ina, V. K. Kritzkaya and L. I. Lysak. *British Atomic Energy Research Establishment*, AERE Lib/Trans 673, 1957, 16 p. (Translated by J. Adam, Harwell, Berks.)

Measurements of X-ray diffraction line widths and intensities yield fundamental data related to the fine structure of metals and alloys. These are: sizes of coherent scattering domains for X-rays, magnitude of elastic deformation in crystallites, amplitudes of atomic thermal vibrations and static disordered displacements of atoms in the lattice. Based on these methods are studies of phenomena of hardening and softening of metals and alloys. 27 ref. (M22g, M26)

215-M. Anodizing as a Metallographic Technique for Zirconium Base Alloys. M. L. Picklesimer. *U.S. Atomic Energy Commission*, ORNL-2296, May 24, 1957. 14 p. (CMA)

Anodizing method used for titanium-base alloys has been modified for phase identification in zirconium alloy systems. Optical contrast of microstructures is thus improved and etched surfaces are preserved. A thin oxide film is formed on the specimen in an electrolytic bath of ethanol, water, phosphoric acid, lactic acid, glycerin and citric acids; voltages vary from 20 to 140 v., depending on the purpose and the color desired. Zirconium hydride needles are identified easily. (M23; Zr)

216-M. Studies of the Titanium-Aluminum System. K. Sagel, E. Schulz and W. Zwicker. *Henry Brutcher Translation* No. 3909, 6 p. (From *Zeitschrift für Metallkunde*, v. 47, no. 8, 1956, p. 529-534.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 392-M, 1956. (M24; Ti, Al)

217-M. How to Reveal the Microstructure of Non-Etching Surface Layers on Ferrous Metals. B. A. Krasyuk. *Henry Brutcher Translation* No. 3920, 3 p. (From *Zavodskaya Laboratoriya*, v. 22, no. 5, 1956, p. 556-558.) Henry Brutcher, Altadena, Calif.

Failure of known etchants to bring out the structure of surface layers of ferrous metal parts subjected to metallic impregnation, as chromizing, also to electrosparking and the like; study of causes of this failure, based on determination of electrochemical potentials; proposed change to mounting of specimens for grinding, polishing, and etching. (M20)

218-M. Rapid Method of Bringing Out the Primary Structure of Welds.

A. A. Rossoshinskii. *Henry Brutcher Translation* No. 3936, 3 p. (From *Zavodskaya Laboratoriya*, v. 22, no. 5, 1956, p. 558-560.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 296-M. (M21, K1, M27)

219-M. (French.) Electron Microscope: 60,000 Magnification. *Journal d'Informations Techniques des Industries de la Fonderie*, no. 83, Dec. 1956-Jan. 1957, p. 17-18.

Research possibilities; application to foundry practice; essential principles underlying its use; methods applied for the examination of metallic samples. (M21e)

220-M. (French.) Metallographic Atlas of the Types of Microstructure of Copper Alloys. *Journal d'Informations Techniques des Industries de la Fonderie*, Supplement to no. 83, Dec. 1956-Jan. 1957, 20 p.

Clear reproduction of slides covering bronze, bronze with lead, brass, copper, cupro-aluminum and alloys such as Monel. Preparation of samples; macrographic and micrographic examination after attack by ferric chloride. (M27d, M20; Cu)

221-M. (French.) Film Mounts and Printing Techniques in Electron Microscopy. Roger Dargent. *Metaux-Corrosion-Industries*, v. 32, Apr. 1957, p. 135-148.

Observation of transparent objects; types of films (aluminum, carbon, etc.) and methods of preparation; replica technique. (To be continued.) (M20r)

222-M. (German.) Etching of Gallium Arsenide. Hans Achim Schell. *Zeitschrift für Metallkunde*, v. 48, Apr. 1957, p. 158-161.

Description of a new etching technique. 6 ref.
(M20q; Ga, As, 14-18)

223-M. (German.) Metallographic Preparation of Noble Metals by Electropolishing. Gerhard Reinacher. *Zeitschrift für Metallkunde*, v. 48, Apr. 1957, p. 162-170.

An apparatus for electrolytic lapping for use on metals which cannot be easily polished anodically. The method works with homogeneous as well as heterogeneous alloys. The advantages of the technique are shown, using noble metals as examples. 46 ref.
(M20p, 1-3; EG-c)

224-M. (German.) Structure of NiAs Type Crystals. Pt. II. Meaning of Structure Correlation Based on Outer Electrons. Konrad Schubert and Paul Esslinger. *Zeitschrift für Metallkunde*, v. 48, Apr. 1957, p. 193-200.

A special correlation of the outer electrons in nickel arsenide type crystals is proposed which leads to a better understanding of some aspects of this structure. 21 ref.
(M26q; Ni, As)

225-M. Crystal Structure of the Metallic Phase Mg_{32} (Al, Zn)49. Gunner Bergman, John L. T. Waugh and Linus Pauling. *Acta Crystallographica*, v. 10, Apr. 10, 1957, p. 254-259.

A complete determination of the crystal structure of the ternary phase (lambda or T phase) in the magnesium-aluminum-zinc system with composition approximately $Mg_3Zn_3Al_2$ has been carried out with use of intensity data from single-crystal Weissenberg photographs. The refinement of the structural parameters was carried out by use of Fourier projections, followed by application of the method of least squares. 20 ref. (M26q; Mg, Al, Zn)

226-M. Potentialities of X-Ray Diffraction Studies in Non-Destructive Testing. J. R. Rait and H. S. Peiser. *British Journal of Applied Physics*, Supplement No. 6, Physics of Non-Destructive Testing 1957, p. S13-S17.

Limitations of X-ray diffraction tests. Five groups are useful: fluorescent spectrometry; diffractometric phase analysis; X-ray measurements of orientation textures; determination of lattice parameters which depend on solid-solution, temperature and strain effects; and determinations of line profiles related to crystal size and perfection. 7 ref. (M22g)

227-M. Variation in Lattice Constant in Thin Films of Gold. S. N. Chatterjee. *Indian Journal of Physics*, v. 31, Feb. 1957, p. 110-116.

Lattice constants of gold for films of different thicknesses (3-120 Å) were determined by the electron diffraction technique. It was found that for thin films of gold (1-10 Å) the lattice constant increases by about 5% over the value of the constant for films (40-120 Å) thick. 11 ref. (M26; Au, 14-12)

228-M. X-Ray Determination of Conjugate Deformation Twins in Copper. F. A. Sherrill, M. C. Wittels and T. H. Blewitt. *Journal of Applied Physics*, v. 28, May 1957, p. 526-529.

The unambiguous determination of the twin relationships is accomplished by a unique X-ray technique which makes use of a single crystal adapter and Geiger counter methods. The adapter permits the detection and measurement of weakly diffracting reflections, and the twin relationships are established by the unique application of geometrical data in a stereographic projection. (M26c, M22g; Cu)

229-M. X-Ray Study of Order in the Alloy $CuAu_3$. B. W. Batterman. *Journal of Applied Physics*, v. 28, May 1957, p. 556-561.

Measurements of the integrated intensity of the superstructure reflections 100 and 110 from powders and a single crystal of $CuAu_3$ give a long-range order parameter $S = 0.87 \pm 0.04$ for a temperature below T_c not well defined. At the composition $CuAu_3$, $T_c = 199°$ C. With decreasing Au content, T_c increases. Compositions richer in Au than $CuAu_3$ could not be ordered.
(M26, M22g; Cu, Au)

230-M. Electronic Distinction Between Metals and Nonmetals. R. T. Sanderson. *Journal of Chemical Education*, v. 34, May 1957, p. 229.

With the single exception of hydrogen, all elements are metals if the number of electrons in the outermost shell of their atoms is equal to or less than the period number of the element (which is the same as the principal quantum number of that shell). (M25)

231-M. Metallographic View. Pt. 33. Metallography of Tool Steels. Water and Oil-Hardening Types. Howard E. Boyer. *Steel Processing and Conversion*, v. 43, Apr. 1957, p. 205-206.

Note on the microstructure of three toolsteels hardened and tempered; one brine-quenched, the other oil-quenched. (M27, J26; TS)

232-M. (Czech.) Possibilities of Using Electron-Emission Microscopy in the Investigation of Metal Structures. Bohdan Sestak. *Hutnické Listy*, v. 12, Mar. 1957, p. 202-215.

Describes an adaptor for a table electron microscope of Czech origin by means of which the electron microscope can be used in thermo-emission. By means of thermo-emission the influence of the deformation of a surface layer formed during mechanical grinding and polishing was examined; growth of the austenitic grain and the relation to temperature and time were observed. The microscope can be used in the examination of the structures of current carbon steels in the temperature range from 750 to 900° C.
(M21e, 1-3, M27, N3; CN)

233-M. (French.) Influence of Very Small Percentages of Foreign Atoms on the Structure of the Iron-Oxide Interface of Iron. Raymond Sifferlen and Claude Bourelier. *Comptes Rendus*, v. 244, Apr. 15, 1957, p. 2160-2163.

Interface irregularities are directly related to segregation of foreign atoms and imperfections in network structure in vicinity of interface. 4 ref. (M26r; Fe)

234-M. Twin Intersections in Titanium. F. D. Rosi. *Acta Metallurgica*, v. 5, June 1957 p. 337-339. (CMA)

Four types of twin intersections were observed in a number of coarse-grained alpha-titanium specimens. In one type, one twin acts as an impenetrable barrier to the other and there is a marked difference between the twins regarding thickness. In the second type, the path of the crossing twin is deflected by the crossed twin and suffers a stepped discontinuity. In the third type, one of the twins is displaced and continues anew on the opposite side of the other twin. In the fourth type, one twin appears to pass through the other, apparently splitting it; neither is displaced. (M27e; Ti)

235-M. New Method of Preparing Thin Metallic Films for Electron Microscopy. Noboru Takahashi, Kan-Ichi Ashinuma and Masaru Watanabe. *Journal of Electron Microscopy*, v. 5, (Annual Edition) 1957, p. 22-27.

An apparatus for preparing thin metallic films was constructed on the basis of a new method of melting. These films show the metallographic features similar to that of industrial metallic materials with the corresponding electron diffraction patterns when examined by a three-stage electron microscope. Examples for metals and alloys such as Al, Al-Ag, Al-Zn, Pb-Sn, etc., are given. (M20s, M21e)

236-M. Remeasurement of Liquidus Temperatures of Mg-Ba Alloys. K. P. Anderko. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, Apr. 1957, p. 612.

Note giving liquidus temperatures of magnesium-barium alloys in the 6 to 27 at. % barium range. 3 ref.
(M24b, Mg, Ba)

237-M. Magnetic Analogy of a Dislocation. A. G. Guy and L. G. Criswell. *Metal Progress*, v. 71, June 1957, p. 82-84.

Two rows of equally spaced magnets, the upper one swung like a pendulum, form a physical model which illustrates that the force necessary to cause slip in a perfect crystal is much greater than in a crystal containing dislocations.
(M26b, Q24a, 17-6)

238-M. Metallographic View. Pt. 34. Metallography of Tool Steels. Higher Alloy Types. Howard E. Boyer. *Steel*

Processing and Conversion, v. 43, May 1957, p. 267-268.

Note on microstructures and hardness values for three high-alloy type toolsteels which were air quenched from about 1800° F. and tempered at 900° F. (M27, Q29a, TS)

239-M. Structural Changes in Uranium-12 w/o Molybdenum Alloy During Experimental Fuel Rod Fabrication. J. G. Goodwin. *U.S. Atomic Energy Commission,* WAPD-125, Jan. 26, 1956, 24 p. (CMA)

Zircaloy-2 clad fuel rods of U-12% Mo were produced through steps which included induction melting, consumable electrode arc melting, ingot extrusion, billet extrusion for cladding, cold or hot drawing, cold or hot swaging, annealing and straightening. Grain structure of the alloy changes through these processes shown by micrographs. (M27c, 3-20, T11g, 17-7; U, *Mo, Zr,* 8-16)

240-M. (French.) Concentration of Hydrogen in the Lattice of Alpha Iron. Jacques Plusquellec, Pierre Azou and Paul Bastien. *Comptes Rendus,* v. 244, Feb. 25, 1957, p. 1195-1197.

X-ray diffraction reveals that hydrogen tends to concentrate in lattice defects and permits explanation of phenomena connected with presence of hydrogen in iron. 3 ref. (M26, N15e; Fe, *H*)

241-M. (French.) Structure of Certain Chromium Nickel Steels. Jean Bourrat, Louis Colombier, Joseph Hochmann and Jean Pilibert. *Comptes Rendus,* v. 244, Feb. 25, 1957, p. 1197-1200.

Electronic probe micro-analyzer permits determination of percentages of nickel and chromium in austenitic and ferritic phases. (M27, M23s; SS, *Ni, Cr*)

242-M. (French.) Deformations, Ruptures and Dislocations of the Crystalline Structures of Metals. A. Roos. *Génie Civil,* v. 134, May 1, 1957, p. 198-205.

Study of ruptures caused by tensile tests, impact tests and corrosion; deformation caused by strain and cold working. These phenomena can be explained, in certain phases by the "theory of dislocations". (M26b, 9-22)

243-M. (Russian.) Identity Period of the Lattice of Pure Metallic Vanadium and Changes in This Period Produced by the Presence of Oxygen. M. A. Surevich and B. F. Ormont. *Fizika Metallov i Metallovedenie,* v. 4, 1957, p. 112-114. (CMA)

The presence of very small amounts of impurities, especially oxygen, renders vanadium brittle. The authors investigated this situation roentgenographically by measuring the identity period of the crystal lattice, in this case the side of the elementary cube of vanadium samples prepared by different methods: spectrally pure vanadium, with only traces of iron, obtained by reduction of V_2O_5 with calcium; 97-98% V, containing aluminum, iron and oxygen, prepared by reducing V_2O_5 alumothermally; 90% V, with 3% Ca and 7% O, prepared by reducing V_2O_5 with calcium. Only the spectrally pure variety was plastic; the others were brittle, the brittleness increasing with the oxygen content. Since it was found that the size of the elementary cell increases regularly with the oxygen content, the X-ray analysis of a given sample can serve as a method for determining that content. This method could perhaps be applied to other metals. 13 ref. (M26n, 3-19; V-a)

244-M. (Book.) Constitutional Diagrams of Alloys: a Bibliography. Originally compiled by J. L. Haughton; second edition compiled by A. Prince. 323 p. 1956. Institute of Metals, 4 Grosvenor Gardens, London, S.W. 1. $5.50.

Criterion for including references in the bibliography (paper must contain part or the whole of any equilibrium diagram) remains the same as that used in first edition. Additional references have been inserted and this second edition is brought up to date to the end of 1954. (M24; 11-15)

245-M. (Book.) Phase Diagrams in Metallurgy. Their Development and Application. Frederick N. Rhines. 340 p. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N.Y. $12.

Presentation is designed to lead the student into the subject gradually, beginning with one-component system, progressing through binary, ternary and quaternary systems, and ending with a brief treatment of pressure-temperature diagrams. (M24)

N Transformations and Resulting Structures

200-N. Growth of Zinc Whiskers. R. V. Coleman and G. W. Sears. *Acta Metallurgica,* v. 5, Mar. 1957, p. 131-136.

Zinc whisker growth studied by vapor deposition of a pure phase in the presence of an inert gas. 11 ref. (N15g; Zn)

201-N. Crystallography of Martensite Transformation. Pt. IV. Body-Centered Cubic to Orthorhombic Transformations. J. K. Mackenzie and J. S. Bowles. *Acta Metallurgica,* v. 5, Mar. 1957, p. 137-149.

Theoretical predictions of habit planes, orientation relationships and directions of the homogeneous strain compared with available experimental data and found to be in satisfactory agreement for transformations in Cu_3Al, AuCd and Ti. 27 ref. (N6q; Cn, Al, Au, Cd, Ti)

202-N. Diffusion in Multicomponent Metallic Systems. J. S. Kirkaldy. *Canadian Journal of Physics,* v. 35, Apr. 1957, p. 435-440.

Onsager's phenomenological scheme for diffusion in multicomponent liquid systems is examined for suitability as a description of metallic interdiffusion. Subject to certain restrictions and approximations, a set of nonlinear differential equations is obtained which can be simply applied to important boundary conditions. 9 ref. (N1b)

203-N. Diffusion of Nickel in Nickel Oxide. Moon Taik Shim and Walter J. Moore. *Journal of Chemical Physics,* v. 26, Apr. 1957, p. 802-804.

Diffusion coefficients for nickel in polycrystalline and monocrystalline nickel oxides have been measured by the surface-activity method from 1000 to 1400° C. in air. The results indicate that the oxidation of nickel under comparable conditions of temperature and pressure proceeds via lattice diffusion of nickel through nickel monoxide. (N1c, R1h; Ni)

204-N. A Note on the Effect of Antimony on Hole Formation During the Diffusion of Zinc From Brass in Vacuo. L. M. T. Hopkin. *Journal of the Institute of Metals,* v. 85, May 1957, p. 422-424.

Presence of antimony increases formation of holes associated with Kirkendall effect. Addition of 1-2% antimony to copper produced severe intergranular embrittlement in impact and tensile tests at elevated temperatures. 9 ref. (N1, Q26s; Cu-n, *Zn*)

205-N. Effect of Dissolved Oxygen on the Grain Size of Annealed Pure Copper and Cu-Al Alloys. D. L. Wood. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 406-408.

Microscopic investigation indicated that grain growth restraint which occurs in advance of aluminum oxide front during internal oxidation of copper-aluminum alloys is result of oxygen in solid solutions. Oxygen in solid solution restrained grain growth in pure copper. (N3, R2s; Cu, Al)

206-N. Action of Vibration on Solidifying Aluminum Alloys. P. D. Southgate. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 514-517.

Records size reduction of intermetallic crystals, decreased gravity segregation of these crystals, grain refinement and porosity reduction upon introducing metal probe vibrating at 8 kc. per sec. into small melts of solidifying aluminum alloys. Discusses cavitation hypothesis as explanation for effect of vibration. (N12; Al)

207-N. Habit Planes of Martensite in Chrome-Carbon Steel. H. M. Otte and T. A. Read. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 412-417.

Observations on scatter of habit planes of martensite in a 2.8% chromium and 1.5% carbon steel; proposes possible reasons for existence of real scatter. 13 ref. (N8p; AY, *Cr*)

208-N. Grain Growth of Titanium Carbide in Nickel. Leonard P. Skolnick. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 438-442.

Metallographic investigation of grain growth of titanium carbide compacts infiltrated with liquid nickel showed three successive growth stages. 17 ref. (N3; Ti, Ni, 6-19)

209-N. Structural Changes Associated With Strain-Induced Grain Boundary Migration in Silicon-Iron. K. T. Aust and C. G. Dunn. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 472-478.

Applies chrome-acetic electro-etching method of locating dislocations to problem of strain-induced grain boundary migration in bi-crystals of silicon-iron (3¼% Si). Cold rolled 2 to 12% and annealed; observes dislocations, configurations and densities in adjacent grains before and after boundary movement and extent of crystal perfection in swept-out region. (N3, M26; Fe, *Si*)

210-N. On the Texture of Evaporated Films. R. B. Kehoe. *Philosophical Magazine,* v. 2, 8th Ser., Apr. 1957, p. 455-466.

Copper, silver and gold were evaporated onto heated cleavage surfaces of alkali halide crystals in an electron diffraction camera. The

diffraction patterns were studied continuously as the depositions were carried out and the crystalline arrangement in the films was deduced as a function of thickness. 20 ref. (N15g, M22h; Cu, Ag, Au)

211-N. Kinetics of Nucleation in Supersaturated Vapors. Pt. I. R. Becker and W. Doring. *Henry Brutcher Translation* No. 3655, 13 p. (From *Annalen Der Physik*, v. 24, 1935, p. 719-731). Henry Brutcher, Altadena, Calif.

Review of published work; mathematical treatment of nucleation in supersaturated systems; thermodynamics of nucleation; concept of critical droplet size and its implications; liquid nuclei; consideration of a quasi-stationary condensation process; resistance as function of relative droplet radius; evolution of a formula which correctly reflects the entire available experimental data. (N2g)

212-N. Autoradiographic Study of Microsegregation in Steel. I. E. Bolotov. *Henry Brutcher Translation* No. 3866, 7 p. (From *Zavodskaya Laboratoriya*, v. 22, no. 6, 1956, p. 682-688). Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 372-N, 1956. (N12, M23; ST)

213-N. (English.) **Study on Internal Adsorption of Carbon in Alpha-Iron by the Method of Internal Friction.** Yung Pao-Tsui and Ke T'ing-Sui. *Scientia Sinica*, v. 5, Dec. 1956, p. 645-656.

The change of the height of the carbon diffusion peak was observed during the process of decarburization of an alpha-iron specimen containing a small amount of carbon and it was found that the height of the peak first decreased and then increased with time to a maximum value. This indicates that the carbon adsorbed in iron goes into solid solution twice during the process of decarburization. 18 ref. (Ni, Q22, J4a; Fe, *C*)

214-N. (German.) **Kirkendall Effect in Silver-Gold Alloys.** Theodor Heumann and Guntram Walther. *Zeitschrift für Metallkunde*, v. 48, Apr. 1957, p. 151-157.

The migration of marked planes during the diffusion of binary solutions is considered; it is found that the direction of their migration is that of the plane of joining, only in certain places. In an investigation of silver-gold this change of direction has been found in the gold-rich and silver-rich ends of the diffusion curves. 11 ref. (N1e; Au, Ag)

215-N. (Japanese.) **Recrystallization Phenomena of Aluminum in Aluminum Chloride Baths.** Rinzo Midorikawa. *Electrochemical Society of Japan Journal*, v. 25, Jan. 1957, p. 13-16.

It is thought that the recrystallization process of aluminum is characterized by the formation of trivalent or monovalent aluminum in the salt bath at a temperature between 100 and 200° C.; discussion of aluminum recrystallization process and various experiments. 18 ref. (N5; Al)

216-N. (Japanese.) **Study on Refinement of Recrystallized Grain Size of 3S Alloy. Pt. 8. Effect of Iron and Silicon on the Precipitation Process of Aluminum-Manganese Alloy.** Kyoji Shimizu, Yoshizo Nakatani and Masaaki Yoshizaki. *Light Metals*, v. 7, Mar. 1957, p. 23-36.

Behavior of the precipitates formed during the preheating of aluminum-manganese, aluminum-manganese-iron, aluminum-manganese-silicon, and aluminum-manganese-iron-silicon alloys was investigated by measurements of the electrical resistance and microhardness, X-ray analysis and microscopical examination. (N8; Al, *Mn*)

217-N. (Japanese.) **Influence of Impurities on Some Properties of High-Purity Magnesium. Pt. 1. Effect of Zirconium on Cast Structure.** Riei Ichikawa. *Light Metals*, v. 7, Mar. 1957, p. 44-49.

Effect of zirconium on the grain refining of cast high-purity magnesium containing aluminum, silicon and manganese as impurities and the influences of aluminum, silicon and manganese as impurities on grain refinement of cast magnesium-zinc-zirconium alloys. (N3, 1-10; Mg, *Zr*)

218-N. Effect of Silicon on the Solubility of Nitrogen in Alpha and Gamma-Iron. R. Rawlings. *Iron and Steel Institute, Journal*, v. 185, Apr. 1957, p. 441-449.

Effect of silicon on nitrogen solubility in iron for temperature range 700-1000° C. determined by nitriding several iron-silicon alloys in partially dissociated ammonia. 12 ref. (N15d; Fe, *Si*, *N*)

219-N. Effect of Some Common Alloying Elements on the Breakdown of Martensite in a W.Q. 0.35% Carbon Steel. A. S. Kenneford and T. Williams. *Iron and Steel Institute, Journal*, v. 185, Apr. 1957, p. 467-474.

Dilatometrical investigation on effect of silicon, manganese, nickel, chromium, molybdenum, vanadium and cobalt on the breakdown of martensite in steel containing about 0.35% carbon. Silicon delays softening during tempering by raising temperature at which martensite decomposes to ferrite and cementite. Other elements have little effect on temperature range of martensite decomposition. Chromium, vanadium, molybdenum delay softening during tempering by other mechanisms. (N8a, 2-10; AY)

220-N. Physical Metallurgy of Low-Carbon, Low-Alloy Steels Containing Boron. K. J. Irvine, F. B. Pickering, W. C. Heselwood and M. Atkins. *Iron and Steel Institute, Journal*, v. 186, May 1957, p. 54-67.

Transformation characteristics of low-carbon, low-alloy steels containing boron which were examined isothermally and on continuous cooling; effect on transformation diagram of small amount of molybdenum, tungsten and carbon in presence of boron; direct relation of mechanical properties to types of transformation products; suggests hypothesis for the mechanism by which boron promotes hardenability. 21 ref. (N8, J5, 2-10; AY, *B*)

221-N. High Temperature X-Ray Study on High Speed Steel. Pt. 1. Lattice Expansion of Matrix and Carbide. H. J. Goldschmidt. *Iron and Steel Institute, Journal*, v. 186, May 1957, p. 68-78.

X-ray study of the lattice expansion of ferrite, austenite and eta carbide phases in a normal 18-4-1 W-Cr-V type high-speed steel in the annealed condition for temperatures up to 1100° C. Resulting coefficients are interpreted in terms of "physical" and "chemical" expansion. 27 ref. (N8, M26; TS-m)

222-N. High-Temperature X-Ray Study on High Speed Steel. Pt. 2. Transformations During Tempering and Some Considerations on Martensite-Type Reactions. *Iron and Steel Institute, Journal*, v. 186, May 1957, p. 79-85.

Phase transformations during tempering of a quenched high speed 18-4-1 W-Cr-V steel were followed at 500, 550, and 600° C. by high-temperature X-ray and the progress of isothermal austenite to martensite to ferrite decomposition directly observed. Differences in the rate and manner are discussed and meaning of expansion coefficient of the temper phases is considered. 25 ref. (N8a, N8p; TS-m)

223-N. Correlation of Tensile Properties With Microstructure of Some 3% Nickel Steels. J. P. Hugo and J. H. Woodhead. *Iron and Steel Institute, Journal*, v. 186, June 1957, p. 174-188.

Relationships between isothermal transformation temperature and tensile properties of three 3% Ni steels were studied. In the pearlite range, confirmation was obtained for theory that interlamellar spacing of pearlite is inversely proportional to degree of undercooling. Thus, by relating all properties to degree of undercooling rather than to transformation temperature, effect of interlamellar spacing was determined. For pearlitic steels it was shown that after allowing for effects of proeutectoid ferrite, strength properties are linearly dependent on square root of the interlamellar spacing. Such a relationship is in accordance with dislocation theory. 29 ref. (N8, Q27a; AY, *Ni*)

224-N. Studies on Ball Bearing Steels. Pt. VIII. Behaviour of Carbides in Ball Bearing Steels by Electrolytic Isolation. Manabu Ueno and Hirooki Nakajima. *Journal of Mechanical Laboratory*, v. 11, May 1957, p. 108-113.

To investigate the nature of the cementite and matrix in ball bearing steels, cementite was isolated electrolytically; one SKF steel was compared with Japanese made steels by chemical analysis, electron-microscope and other methods. Analysis of results. 3 ref. (N8r, S11f; ST, SGA-c)

225-N. Some Estimates of the Thermal Stability of Dispersion-Hardened Alloys. A. W. Cochardt. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, Apr. 1957, p. 434-437.

Factors that govern thermal stability of dispersion hardened alloys; explains mechanism of over-aging. Makes estimates of time in which structural changes should occur in alloys hardened with aluminum oxide or other common hardeners. (N7; AD-q40)

226-N. Some Observations on Ferrite-Carbide Aggregates in Alloy Steels. E. S. Davenport. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, May 1957, p. 677-688.

Briefly reviews literature on the isothermal transformation behavior of steels. Data on microstructure and mechanical properties of ferrite, carbide aggregates in nickel-chromium-molybdenum alloy steels of eutectoid carbon content. Aggregates formed from austenite by isothermal transformation grouped as lamellar intermediate acicular relating to the temperature in which they were

formed. Mechanical properties of aggregate in intermediate range are inferior to those of fine pearlite and of bainite. 18 ref. (N8g; AY)

227-N. Peritectoid Transformation in Ag-Al Alloys. C. W. Spencer, R. J. Knight and F. N. Rhines. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, May 1957, p. 688-689.

Metallographic study of the peritectoid transformation as it occurs in two silver-aluminum alloys containing 6.0 and 6.9% aluminum respectively. 4 ref. (N11g; Ag, Al)

228-N. Hydrogen Control Cuts Titanium Rejections. *Light Metal Age,* v. 15, June 1957, p. 17-18. (CMA)

Chance-Vought has reduced the hydrogen content of its titanium alloys so far that rejections have been cut from 17 to 0.5% in two years. The F8U-1 Crusader use 650 lb. of titanium in its tail cone and aft fuselage. A maximum of 150 ppm. has been established for hydrogen in titanium alloy sheet. Vacuum hot extraction gas analysis equipment is used to determine the amount of hydrogen. (N15d, T24, 17-7; Ti, *H*)

229-N. (French.) Investigation by Means of Electronic Microdiffraction and Microscopy of the Transformation of the Alloys of Al-Cu by Heat in a Vacuum. N. Takahashi and K. Mihama. *Acta Metallurgica,* v. 5, Mar. 1957, p. 159-168.

Metallurgical transformation was observed in single crystal state, obtained by heating specimen to about 500° C. and when using 4% Cu alloy to observe a Cu-Al monocrystal. 11 ref. (N6, M22h, 1-23; Al, Cu)

230-N. (French.) Solubility of Oxygen in High-Purity Iron. Raymond Sifferlen. *Comptes Rendus,* v. 244, Feb. 25, 1957, p. 1192-1193.

New experiments confirm that solubility of oxygen tends to become nil in case of a very pure, perfectly recrystallized iron. 2 ref. (N15e; Fe, *N*)

231-N. (French.) Influence of Purity and Structural State of Iron on Its Absorption Capacity for Cathodic Hydrogen. Simone Besnard and Jean Talbot. *Comptes Rendus,* v. 244, Feb. 25, 1957, p. 1193-1195.

Further tests on hydrogen absorption using high-purity iron obtained by the zone melting process. 4 ref. (N15e; Fe, *H*)

232-N. (French.) Influence of Stresses on the Allotropic Transformation of Cobalt. Hervé Bibring and Francois Sebilleau. *Comptes Rendus,* v. 244, Mar. 11, 1957, p. 1496-1499.

Description of tests performed on 99.5% pure samples of polycrystalline cobalt containing 0.1% Ni, 0.1% Fe and 0.02% Cu; results. 4 ref. (N6p, 3-16; Co)

233-N. (French.) Influnce of Adsorbed Gases on Surface Recrystallization of Zinc. Mireille Fritz. *Comptes Rendus,* v. 244, Mar. 25, 1957, p. 1769-1771.

Such influence varies inversely to annealing temperature. (N5, J23; Zn)

234-N. (French.) Orientation of the Alpha Cold Working Phase Following Plastic Deformation of an Unstable Austenitic Steel. Paul Bastien and René Margerand. *Comptes Rendus,* v. 244, Mar. 25, 1957, p. 1774-1777.

Alpha phase appears only if the austenite has previously been oriented by means of a sufficient plastic deformation (10 to 20% compression). (N8, 3-18; ST)

235-N. (French.) Study of the Tungsten-Silicon Melting Diagram. René Blanchard and Jean Cueilleron. *Comptes Rendus,* v. 244, Mar. 25, 1957, p. 1782-1785.

Diagram established by determination of melting points, chemical analysis, metallographic and X-ray examination of a very large number of tungsten-silicon alloys. 7 ref. (N12, P12n; W, Si)

236-N. (French.) Orientation of Cobalt Precipitations in a CuCo Alloy. Louis Weil, Lucie Gruner and André Deschamps. *Comptes Rendus,* v. 244, Apr. 15, 1957, p. 2143-2146.

Magnetic measurements taken at very low temperatures to avoid fluctuation showed that cobalt segregations in an elongated alloy are oriented. This orientation may be due to an epitaxy of the cobalt in the copper or to the elongated shape of the precipitates. (N7; Cu, Co)

237-N. (French.) Surface Reactions on Stainless Steels. T. N. Rhodin. *Journal de Chimie Physique,* v. 54, Jan. 1957, p. 72-89.

Three gas-metal reactions studied: adsorption, oxidation and decarburization. 38 ref. (N15d, P13d, R1h, J4a; SS)

238-N. (Japanese.) Working and Recrystallization of Commercially Pure Titanium. T. Morinaga, T. Takahashi and T. Taki. *Light Metals (Tokyo),* no. 23, Mar. 1957, p. 63-70. (CMA)

Commercial titanium wire was studied by X-ray methods and microscopy, and changes in specific resistivity were observed microscopically by changes in the titanium grain size. Twinned and untwinned grains show similar hardness but the latter may be slightly harder. Many newly recrystallized grains nucleate from the deformed coarse grains when they are heated up through the transformation range. Electrical resistivity is almost recovered below 400° C. Minimum values occur in the 500-550° C. range. Annealing at high temperature does not cause the recrystallized grains to grow much. (N5f, P15g; T-a)

239-N. (Russian.) Determination of Heat of Phase Transformation of Cerium Under Pressure. M. G. Gonigberg, G. P. Shakhovskoi and V. P. Butuzov. *Zhurnal Fizicheskoi Khimii,* v. 31, Feb. 1957, p. 350-353. (CMA)

It is known that under elevated pressure metallic cerium transforms into a new modification of the same crystallographic structure but having smaller lattice parameters. However, due to the fact that the compressibility gradually decreases before the actual transformation, no precise measurements could be made either of the pressure or the volume change of the transformation, values that are necessary for the calculation of the latent heat of the process. The latter heat effect was directly determined by applying to high pressures the method of thermograms in which comparison is made of heat effect of phase transformations in the examined substance and a known standard. The heat of transformation of cerium was found to be 880 ± 40 cal. per g.-atom at 13-18° C. and about 7000 kg. per sq. cm. pressure. This result confirms the hypothesis of the structural identity of the new phase and the low-temperature modifications of cerium. 13 ref. (N6, P12q, 3-24; Ce)

240-N. Graphitization of Cast Iron. Studies on the Expansion of Cast Iron During Heating. Report 1. Isamu Igarashi and Yo Serita. *Casting Institute of Japan, Journal,* v. 29, Mar. 1957, p. 141-145.

Graphitization of cast iron studied by means of microscope and differential dilatometer. Specimens were prepared from chill castings of 3.6% carbon alloys to which silicon, phosphorus and chromium were added respectively. The thermal expansion test was carried out in a vacuum (10^{-3} mm. Hg) keeping the heating temperature at 900° C. At 900° C. the contraction in the first period caused by the precipitation of carbide into austenite domain was observed. Discusses graphite precipitation and austenite growth. (N8s, P11g, CI-q)

241-N. Study on High Silicon-Aluminum Alloys. Report 1. Mechanism of Refining of Primary Silicon Crystal. Shiro Terai. *Casting Institute of Japan, Journal,* v. 29, Mar. 1957, p. 157-163.

The mechanism of refining of primary silicon crystal in silicon-aluminum alloys by the addition of small amounts of phosphorus was studied. Such addition to aluminum alloys with high silicon content caused the formation of nuclei of primary silicon crystal. 8 ref. (N2; Si)

242-N. Reaction of Zirconium With Water Vapor at Subatmospheric Pressures. M. W. Mallett, W. M. Albrecht and R. E. Bennett. *Electrochemical Society, Journal,* v. 104, June 1957, p. 349-352. (CMA)

Zirconium was reacted with water vapor at 33 mm. Hg in the range 300-600° C. The rates follow a cubic law, and the rate constant is given as a function of the activation energy (29,700 cal. per mole). Monoclinic oxide films are N-type semiconductors. The formation mechanism is the same as in the zirconium-oxygen reaction. (N15f, R4d; Zr)

243-N. Thermal Stabilization of Austenite in a 10% Ni, 1% C Steel. B. Edmondson. *Acta Metallurgica,* v. 5, Apr. 1957, p. 208-215.

Current knowledge of stabilization of austenite is assessed and stabilization in a 10%, 1% C steel is examined. An explanation of the results obtained in terms of the diffusion of interstitial solute atoms to preferred sites within the metal is proposed. (N8f; SS, *Ni*)

244-N. Graphical Analysis of Diffusionless Phase Changes—the Cubic to Twinned Orthorhombic Transformation. D. S. Lieberman, T. A. Read and M. S. Wechsler. *Journal of Applied Physics,* v. 28, May 1957, p. 532-541.

A simplified method of calculating the crystallographic features of a diffusionless (martensitic) phase change is described and applied to the gold-cadmium alloy cubic orthorhombic transformation. (N6q; Au, Cd)

245-N. (Japanese.) Study on Special Wrought Magnesium Alloys. Pt. 2. Effect of Zirconium Additions on Some Properties of Magnesium and Its Alloys. Shiro Terai. *Light Metals,* v. 7, Mar. 1957, p. 54-62.

Zirconium refines the cast structure of magnesium, raises the recrystallization temperature of magnesium about 100° C., decreases the directionality of magnesium sheet as rolled. (N5, M27, 1-10; Mg, *Zr*)

246-N. (Russian.) Concerning Methods of Research on the Kinetics of Graphitization of Cast Iron. Y. V. Grechnii and N. M. Danilchenko.

Liteinoe Proizvodsvo, no. 3, Mar. 1957, p. 20-22.

The industrial importance of graphitization of ferrous alloys, its supposed mechanism; the speed of the initial formation of graphite; the rapidity of solidification and the time required to raise it to annealing temperature; the influence of preliminary low temperature on the development of graphitizing centers and corresponding kinetic processes. (N8s; CI)

247-N. (Swedish.) Research on Carbides in Alloy Steels. Kehsin Kuo. *Jernkontorets Annaler*, v. 141, no. 4, 1957, p. 206-230.

Tempering of carbon steels; partition of alloy elements between cementite and ferrite; precipitation of alloy carbides and secondary hardening; alloy carbides in tungsten and tungsten chromium steels; results obtained by hardness measurements, electron microscopic examination, chemical analysis and X-ray phase analysis. 39 ref. (N8r; AY)

Physical Properties

241-P. Dynamic Magnetostrictive Properties of Ni-Fe Alloys. C. M. Davis, H. H. Helms and S. F. Ferebee. *Acoustical Society of America, Journal*, v. 29, Apr. 1957, p. 431-434.

The dynamic magnetostrictive properties of nickel-iron alloys containing from 35 to 67.5% nickel investigated to determine their suitability for use in electromechanical transducers. The materials, in the form of toroids made from ring laminations, were evaluated by the motional impedance method. Annealing temperatures were varied from 600 to 1220° C. and the effect of various annealing techniques was investigated. Measured values of the electromechanical coupling coefficient, the reversible permeability, the dynamic magnetostrictive constant, and other parameters. (P16b; Ni, Fe)

242-P. Pressure-Induced Metallic Transitions in Insulators. B. J. Alder and R. H. Christian. *Faraday Society Discussions*, no. 22, 1956, p. 44-46.

Experimental evidence is presented revealing that several ionic and molecular crystals change their conductivity into the range of metallic conductivities when subjected to a pressure of about 250,000 atm. For some of these substances the pressure at which this transition occurs is roughly defined. 6 ref. (P15g, M25, 3-24)

243-P. Nitric Acid Dissolution of Thorium. Kinetics of Fluoride-Catalyzed Reaction. Robert Lee Moore, C. A. Goodall, J. L. Hepworth and R. A. Watts. *Industrial and Engineering Chemistry*, v. 49, May 1957, p. 885-887.

The dissolution of thorium metal, or of thorium oxide, in nitric acid is the first step in the recovery of metallurgical scrap or in the chemical reprocessing of blanket material from breeder-type power reactors. The investigation was undertaken to obtain quantitative information on the rate of the reaction to determine the effect of the variables involved and to develop correlations which would aid general application. 4 ref. (P13b, A11d; Th, RM-p)

244-P. Some Properties of Certain High-Conductivity Copper-Base Alloys. Webster Hodge. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, Apr. 1957, p. 408-412.

Data on electrical conductivity, softening temperature on long-time exposure, hot hardness, tensile properties at room and elevated temperatures, stress-rupture properties for copper containing 0.2% zirconium or 0.8% chromium or 25 oz. of silver per ton.
(P15g, Q general; Cu, SGA-r)

245-P. Electronic Structure of Palladium-Uranium Alloys. J. A. Catterall. *Philosophical Magazine*, v. 2, 8th Ser., Apr. 1957, p. 491-498.

The measured effects of uranium upon the paramagnetic susceptibility, electrical resistivity, thermoelectric power, and lattice parameter of palladium; interpretation of the results in terms of a solvent and solute band is suggested. 14 ref. (P16p, P15g, M26; Pd, U)

246-P. Thermal Conductivity of Metals at Low Temperatures. Deviations From Ideal Behaviour. H. M. Rosenberg. *Philosophical Magazine*, v. 2, 8th Ser., Apr. 1957, p. 541-547.

Measurements of the thermal conductivity of single crystals of zinc and cadmium have been taken between 2 and 20° K. The results show that a plot of WT against T^3 (where W is the thermal resistance) instead of being a straight line, has linear sections at high and at low temperatures, the slope at high temperatures being about three times that at low temperatures. This behavior is shown to be connected with the very marked changes which occur in the values of the Debye temperature. 11 ref.
(P11h, 2-13; Zn, Cd, 14-11)

247-P. Composition Vs. Hot Strength Diagram of the Alloys in the Nickel-Chromium-Titanium System. I. I. Kornilov and L. I. Pryakhina. *Henry Brutcher Translation* No. 3912, 8 p. (From *Izvestiya Akademii Nauk SSSR. OTN*, no. 7, July 1956, p. 103-110.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 448-P, 1956.
(P12, P15, M27, Q29; Ni, Cr, Ti)

248-P. (English.) Electrochemistry of Metallic Single Crystals. Pt. I. Exchange Overvoltages on Silver and Copper. R. Piontelli, G. Poli and L. Paganini. *Nuovo Cimento*, v. 5, no. 1, Apr. 1957, p. 1018-1019.

Anodic and cathodic behavior of single crystal surfaces having a well-defined orientation investigated. (P15; 14-11)

249-P. (German.) Electrical Contacts and Contact Materials. Horst Schreiner. *Zeitschrift für Metallkunde*, v. 48, Apr. 1957, p. 180-190.

Materials for electrical contacts (pure metals, alloys, cermets) discussed systematically on the basis of the general requirements for contacts. Some possible production improvements of known contact materials are suggested. 13 ref.
(P15; SGA-r)

250-P. (Japanese.) Investigation on Cast Iron Having Refined Graphite Produced by Melting Cast Iron Covered With Slag Containing TiO_2 (VI). H. Sawamura and M. Tsuda. *Iron and Steel Institute of Japan, Journal*, v. 43, Apr. 1957, p. 471-480. (CMA)

Titanium is present in gray cast iron both in solid solution and in compounds (i.e., TiC, TiN, TiO, Ti_2O_3, TiO_2, TiO_3 and TiS); 80% of the titanium present in gray cast iron is TiC. Separation and determination procedures used are shown. The solubility of titanium and titanium compounds was tested in dilute and concentrated H_2SO_4 (hot and cold), HNO_3, HCl and aqua regia. Data on the influence of acid concentrations are tabulated. (P12e; CI, *Ti*)

251-P. Magnetic Properties and the Structure of Metals. W. Sucksmith. *British Journal of Applied Physics*, Supplement No. 6, Physics of Non-Destructive Testing 1957, p. S24-S27.

Study of magnetic properties which can be used as an indication of variation in composition and structure of metals. Consideration is given to new developments in magnetism which may have application in future. 9 ref. (P16, M27)

252-P. Principles and Applications of Nuclear Magnetic Resonance. L. E. Drain. *British Journal of Applied Physics*, Supplement No. 6, Physics of Non-Destructive Testing 1957, p. S27-S33.

In metals, nuclear resonance frequencies are shifted due to conduction electrons and this shift is related to the electronic structure of the metal. Distortion produced by impurities or mechanical treatment is often sufficient to broaden the magnetic resonance. Ordinarily reasonances lie in radio-frequency range and may be detected by radio techniques. 12 ref. (P16f)

253-P. Measurement of Elastic Constants by the Ultrasonic Pulse Method. M. F. Markham. *British Journal of Applied Physics*, Supplement No. 6, Physics of Non-Destructive Testing 1957, p. S56-S63.

Apparatus used and accuracy which may be achieved. Method may be applied to polycrystalline materials provided grain size is reasonably small. Crystal symmetry of various metals is discussed.
(P21, 1-3, M26)

254-P. How Castings Hold Dimensional Stability. F. C. Benz. *Iron Age*, v. 179, May 16, 1957, p. 120-121.

Investigation on Meehanite in the as-cast, annealed and heat treated condition to determine degree of stability inherent in material over a period of seven years. (P10d; CI)

255-P. Electron-Spin Resonance and Magnetic-Susceptibility Measurements on Dilute Alloys of Mn in Cu, Ag and Mg. J. Owen, M. E. Browne, V. Arp and A. F. Kip. *Journal of Physics and Chemistry of Solids*, v. 2, Apr. 1957, p. 85-99.

An account of some magnetic measurments made on alloys of copper containing from 0.03 to 11 at. % Mn in the temperature range 2 to 400° K. Less detailed work on silver-manganese and magnesium-manganese also described. All of these alloys are found to obey a Curie-Weiss susceptibility law, and show an electron spin resonance line with free spin g-value. 8 ref.
(P16f; Cu, Ag, Mg, *Mn*)

256-P. Thermal and Electrical Resistivity of Tellurium at Low Temperatures. Gaston Fischer, G. K. White and S. B. Woods. *Physical Review*, v. 106, May 1, 1957, p. 480-483.

Measurements of the electrical and thermal resistivity between 2° K. and room temperature of high-purity tellurium rods prepared by zone refining are reported. The maximum thermal conductivity in the case of a single crystal of 3mm. diam. is about 10 watts per cm. at 4° K.; analysis of the measurements suggests that in the specimens used the thermal conductivity—due predominantly to lattice waves—is limited by scattering at grain boundaries or dislocations for temperatures below 4° K. and at higher temperatures (about 100° K.) by phonon-phonon interaction.
(P11h, P15g, 2-13; Te)

257-P. (German.) **On the Conductivities of Some Ferrous Materials.** Karl Lohberg and Jurgen Motz. *Giesserei*, v. 44, May 23, 1957, p. 305-308.

Communication from the Metal Laboratory of the Metallgesellschaft A.G., Frankfort. Manufacture of alloys; measuring thermal and electric conductivities; conclusions.
(P11h, P15g; CI, ST)

258-P. Effect of Solute Elements on Resistivity. C. R. Vassel. *Acta Metallurgica*, v. 5, June 1957, p. 350-351. (CMA)

An analysis of some 100 solute elements in five solvent metals supports work on alpha-titanium and it is concluded that increases in electrical resistivity may be related to differences in valence. A general analytical discussion is given which includes a note to the effect that there is no valence change with zirconium. (P15g; Zr)

259-P. Determination of the Surface Tensions of Molten Lead, Tin, and Indium by an Improved Capillary Method. D. A. Melford and T. P. Hoar. *Institute of Metals, Journal*, v. 85, Jan. 1957, p. 197-205.

An improved method for measurements up to about 1000° C. Molten metal is forced by measured differential gas (hydrogen) pressure to equivalent levels in two fused silica capillaries of different bore.
(P13h, 1-4; Pb, Sn, In)

260-P. Specific Heat and Resistivity of Mild Steel. P. R. Pallister. *Iron and Steel Institute, Journal*, v. 185, Apr. 1957, p. 474-482.

Spot method used for measurement of specific heat of low-carbon steel from room temperature up to 1000° C. in such a way as to avoid retention of unstable constituents. Includes thermal analysis at various rates of heating and cooling and observations on electrical resistance. 5 ref. (P12r, P15g; CN)

261-P. Surface Tension of Pure Liquid Iron, Cobalt and Nickel at 1550° C. Paul Kozakevitch and Georges Urbain. *Iron and Steel Institute, Journal*, v. 186, June 1957, p. 167-173.

Measurements were made by the sessile drop method. By control of atmosphere and use of pure oxide refractories, it was possible to obtain less than 0.001% dissolved oxygen in the drop. Preparation of samples, control of oxygen pressure in the furnace and use of refractories are described. All results of experimentally successful runs have been reported rather than selected or mean values, thus permitting better evaluation of dispersion. 19 ref.
(P13h; Fe, Co, Ni, 14-10)

262-P. Thermodynamic Properties of CS and Solutions of Sulfur in Carbon-Saturated Liquid Iron. C. J. B. Fincham and R. A. Bergman. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, May 1957, p. 690-694.

Study of equilibria at 1600 and 1800° C. between dilute solution of sulphur in carbon-saturated liquid iron and gas mixture consisting, initially, of argon and CS_2. Results allowed calculation of the standard free energy of formation of gaseous CS and determination of equilibria sulphur pressures over the dilute solution of sulphur in liquid iron. 15 ref. (P12; Fe, *C*, *S*)

263-P. Effects of Radiation on Materials. Julius J. Harwood. *Metal Progress*, v. 71, June 1957, p. 72-74.

Changes in metallic properties by extreme radiation by neutrons and gamma rays are explainable by displacement of atoms in the crystalline lattice or introduction of new atoms (either fission products or transformed elements). Certain new organic substances of quasi-crystallinity have been produced by intense radiation.
(P general, Q general, M25, 2-17)

264-P. Tensile Properties of Porosity-Graded 195 Alloy. Irving J. Feinberg. *Nondestructive Testing*, v. 15, May-June 1957, p. 168-173.

Although hydrogen-gas porosity is known to have a detrimental effect on mechanical properties of aluminum alloys, little work has been published on quantitative effects of this defect. A radiographic classification procedure to obtain reliable porosity-grade assignments before assessing damage is described. The value of Aeronautical Technical Inspection Manual NAVAER-00-15PC-504 in classification is discussed. Quantitative determinations of damage to ultimate tensile strength, yield strength and per cent elongation attendant upon elongated hydrogen-gas porosity were obtained. Expected minimum properties for material containing seven degrees of porosity are presented.
(P10m, S13e, Q27a; Al)

265-P. Magnetic Properties of Alloys Having the Compositions $Mn_{60}Al_x$, $Zn_{20-x}C_{20}$ and $Mn_{60}Ga_xZn_{20-x}C_{20}$. L. Howe and H. P. Myers. *Philosophical Magazine*, v. 2, 8th Ser., Apr. 1957, p. 554-560.

Variation of Bohr magneton numbers with the composition in manganese - aluminum - zinc - carbon alloys and manganese-gallium-zinc-carbon alloys. 3 ref. (P17; Mg, SGA-n)

266-P. Thermal and Electrical Conductivities of Tungsten. Experimental Results on Single Crystals Compared With Theory. J. De Nobel. *Physica*, v. 23, Apr. 1957, p. 349-358.

Results of investigations of electrical and thermal conductivity of four tungsten single crystals are compared with theoretical considerations. From the relation between these conductivities at constant temperature as a function of field strength an estimation of the lattice conductivity is made.
(P11h, P15g; W, 14-11)

267-P. Magnetic Susceptibilities of Lanthanum, Cerium, Praseodymium, Neodymium and Samarium From 1.5° K. to 300° K. J. M. Lock. *Physical Society, Proceedings*, v. 70, June 1, 1957, p. 566-576. (CMA)

Measurements of magnetic susceptibility in the 1.5-300° K. range showed low-temperature anomalies in cerium, neodymium, and samarium at 12.5, 7.5 and 14.8° K., respectively. The metals are believed to be antiferromagnetic below these points. The laws obeyed by the susceptibilities of neodymium, cerium and praseodymium are presented.
(P16, 1-13; La, Ce, Pr, Nd, Sm)

268-P. How Metals Change by Irradiation. H. I. Raiklen. *Product Engineering*, v. 28, Apr. 1957, p. 168-169.

Irradiation effects on metals are large in some instances and negligible in others. Many variables coexist: type, intensity and dosage of radiation; type, purity and initial state of the material; character, temperature and pressure of the surrounding medium. Beneficial changes in bulk properties are not significantly different from those produced by conventional metallurgical methods.
(P general, Q general, 2-17)

269-P. Preliminary Studies of Irradiation Damage to Uranium-Zirconium Alloys. S. H. Paine and W. F. Murphy. *U.S. Atomic Energy Commission*, ANL-5537, Oct. 1956, 27 p. (CMA)

Adding zirconium to uranium fuel elements adds irradiation stability. A U-10% Zr alloy showed greater surface stability than unalloyed uranium. U-4.5 Zr also showed good stability and any tendency to dimensional change was restrained by a thin aluminum cladding, but burnup is relatively low. The fuel materials tend to fission-weld to zirconium.
(P18; T11g, 17-7, 2-17; U, *Zr*)

270-P. (English.) **On the Entropy of Solid and Liquid Metals.** G. Borelius. *Arkiv För Rysik*, v. 11, no. 5, 1957, p. 421-427.

Connections between the potential part of the entropy and the changes of volume. 8 ref.
(P12s; 14-10)

271-P. (French.) **Electrochemical Behavior of Arsenic. Potential-pH Diagram of the System As-H_2O at 25° C.** J. Van Muylder and M. Pourbaix. *Cebelcor Rapport Technique*, no. 46, Feb. 1957, 14 p.

Stability circumstances and formation of arsenic, its oxides and arsenates. Examination of the functioning and circumstances of electrodes of arsenic for the measurement of the pH and for the realization of potentiometric titrations. 19 ref. (P15, R1; As)

272-P. (French.) **Electrochemical Behavior of Zirconium. Potential pH Diagram of the System Zr-H_2O, at 25° C.** M. Maraghini, P. Van Rysselberghe, E. Deltombe, N. de Zoubov and M. Pourbaix. *Cebelcor Rapport Technique*, no. 45, Jan. 1957, 10 p.

Free enthalpy values, oxidation potentials, theoretical circumstances of corrosion, immunity and passivation of zirconium, considerations on the stability of different forms of oxides and hydroxides and curves of solubility as a function of the pH. 23 ref. (P15, R1; Zr)

273-P. (French.) **K Absorption Spectra of Palladium in the Pure Metal and in Pd-Au Alloys.** Chintamani Mande. *Comptes Rendus*, v. 244, Feb. 4, 1957, p. 747-749.

K discontinuity of palladium has been determined for first time. 5 ref. (P17e; Pd, *Au*)

274-P. (French.) **Magnetic Reluctance of Thin Films of Bismuth.** Pierre Huet and Antonie Colombani. *Comptes*

Rendus, v. 244, Mar. 18, 1957, p. 1626-1629.

Note on transverse reluctance when magnetic field is perpendicular to the flow of current. (P16; Bi, 14-12)

275-P. (French.) **Interaction Between One Surface of a Transparent Film of Nickel Obtained by Evaporation and Adsorbed Xenon Atoms.** R. Suhrmann, Von E. A. Dierk, B. Engelke, H. Hermann and K. Schulz. *Journal de Chimie Physique*, v. 54, Jan. 1957, p. 15-18, 45.

Photo-electric measurement of electron extraction and electrical resistance variations during adsorption of xenon under conditions of low pressure and low temperature. 9 ref. (P13d, P15; Ni, *Xe*)

276-P. (French.) **Adsorption of Hydrogen Atoms and Molecules on Platinum.** J. C. P. Mignolet. *Journal de Chimie Physique*, v. 54, Jan. 1957, p. 19-26, 45.

Adsorption of hydrogen on platinum studied at 190 and 20° C., chiefly by measuring surface potential. Less concentrated films are essentially atomic and present a negative surface potential. In highly concentrated films, hydrogen appears chiefly in form of molecules. Molecular adsorption is positive and surprisingly stable, with maximum heat differential of adsorption being about 15 K-cal. per mole. These results, obtained with platinum specimens prepared by evaporation, are contrary to those obtained with platinum sheet. It is probable that the latter results do not hold good for PtH film. 20 ref. (P13d, N16m; Pt, *H*)

277-P. (French.) **Polarity of the Chemisorptive Bond. Measurements of Surface Potential and Conductivity on Evaporated Metallic Film.** W. M. H. Sachtler and G. J. H. Dorgelo. *Journal de Chimie Physique*, v. 54, Jan. 1957, p. 27-36.

Specimens of nickel and tantalum foil were prepared by evaporation under strict vacuum conditions and their electronic extraction potentials and conductivity were measured before, during and after adsorption of a pure gas. Study of the surface potentials obtained leads to conclusion that the chemisorptive bond of the systems studied is of the "covalent" type and slightly polarized. An approximate equation gives surface potential in terms of extraction potential of the absorbing metals and the electronegativity of the adsorbed gas. 52 ref. (P13d, N16m; Ni, Ta)

278-P. (French.) **Emission of Electrons by Metallic Surfaces Following Mechanical Working.** H. Raether. *Journal de Chimie Physique*, v. 54, Jan. 1957, p. 48-52.

A mechanically worked metallic surface presents an emission of electrons which is a function of time. Study with help of a multiplier device to detect electrons shows that there are at least two possibilities of producing an emission of electrons: by disturbance of the lattice; by reaction of the exposed surface to oxygen. (P15k)

279-P. (French.) **Study of Adsorption of Certain Gases on Copper.** F. Bloyaert, D'Or and J. Mignolet. *Journal de Chimie Physique*, v. 54, Jan. 1957, p. 53-57.

Preparation of copper surface by vacuum evaporation; measurement of surface potentials of films of xenon, nitrogen, hydrocarbons, carbon monoxide, oxygen, molecular and atomic hydrogen; vibrating condenser and thermo-electronic methods were used. 8 ref. (P13d, N16m; Cu)

280-P. (French.) **Optical Properties of Thin Films of Palladium.** Damien Malé and Jean Trompette. *Journal de Physique et le Radium*, v. 18, Feb. 1957, p. 128-130.

New method permits simultaneous determination of optical constants and film thickness by measuring reflection and transmission factors. In some cases phases can be determined. 8 ref. (P17a, P17c; Pd, 14-12)

281-P. (French.) **Secondary Electronic Emission Effected by Impact of Sodium Ions on Metal Test Pieces Under Strain Conditions.** P. Goutte and C. Guillaud. *Journal de Physique et le Radium*, v. 18, Mar. 1957, p. 202-203.

Source of ions; experimental apparatus and results obtained. Incomplete results tend to confirm that the increased emission provoked by strain results if the primary bombardment is of an ionic nature. 5 ref. (P15k, 3-18)

282-P. (German.) **Heat Exchange in Regenerators.** Jindrich Spal. *Neue Hütte*, v. 2, Apr. 1957, p. 234-245.

Heat exchange in regenerators, a stabilized periodic process; plate contained in a medium with a sinusoidally variable temperature in the time; generalization extended to any periodic temperature changes; heat exchange in the regenerator in the case of a gas flow. 4 ref. (P11k, S18)

283-P. (German.) **Thermo-Electric Force Changes of Germanium Single Crystals at Low Temperatures.** J. Erdmann, H. Schultz and J. Appel. *Zeitschrift für Natürforschung*, v. 12a, Feb. 1957, p. 171-174.

The differential thermo-electric force of germanium remains relatively constant between room temperature and the boiling point of liquid air. At lower temperatures an increase in the thermo-electric force is found which reaches its maximum at the temperature of liquid hydrogen. 8 ref. (P15p, 1-13; Ge, 14-11)

284-P. (Japanese.) **Investigation on Cast Iron Having Refined Graphite Produced by Melting Cast Iron Covered With Slag Containing TiO_2. Pt. VII. Thermodynamic Study on the Ti Contained in S-H Cast Iron.** H. Sawamura, T. Mori and M. Tsuda. *Iron and Steel Institute of Japan, Journal*, v. 43, May 1957, p. 560-564. (CMA)

The reactions $Ti + C \rightleftarrows TiC(s)$ and $Ti + N \rightleftarrows TiN(s)$ were studied thermodynamically for cast iron with 4% C, 0.25% Ti, 0.008% N, 0.03% S and 0.002% O. Formation temperatures were obtained also for TiO_2, TiO and TiS. The results are inaccurate but an idea was formed of the behavior of titanium in the melt during slow cooling from 1800° C. (P12, E25; CI, *Ti*)

Dates To Remember

NATIONAL METAL CONGRESS & EXPOSITION

SECOND WORLD METALLURGICAL CONGRESS

Chicago—Nov. 2-8, 1957

Q Mechanical Properties and Tests

581-Q. Activation Energies for Creep of High-Purity Aluminum. O. D. Sherby, J. L. Lytton and J. E. Dorn. *Acta Metallurgica*, v. 5, Apr. 1957, p. 219-227.

Activation energies for creep were obtained over temperature range from 77 to 880° K. by rapidly changing the temperature during creep at constant stress. From data obtained validity of theories that postulate stress or strain-dependent activation for creep is questioned. (Q3m, P13a; Al-a)

582-Q. Factors Relating to the Stress-Strain Properties of Cast Iron. G. N. J. Gilbert. *British Cast Iron Research Assoc. Journal of Research and Development*, v. 6, Apr. 1957, p. 546-587.

Mechanism of failure and stress-strain properties are described by considering cast iron as steel plus graphite. Equations giving relationship between stress and strain are considered. (Q25n; CI)

583-Q. Magnesium Alloy Castings: Heat Treatment After Welding Repairs. K. Kornfeld. *Canadian Metals*, v. 20, Apr. 1957, p. 50-60.

Investigation of differences between mechanical properties of unwelded magnesium AZ91 castings versus combined properties of deposited weld metal and parent castings after different heat treatments. Heat treamtents include solution treatment before welding and for stress relief after welding. (To be concluded.) (Q general, 2-14, J27a, J1a, Mg, 5)

584-Q. Laying the Ghost of the Welded Ship. H. J. Nichols. *Canadian Metalworking*, v. 20, May 1957, p. 46-48.

Brittle failures are not restricted to welding. Examples of brittle failures of riveted structures. (Q26s, T24g, 7-1, 7-3)

585-Q. Ni Alloys Shine at High Temperatures. R. M. Wilson and W. F. Burchfield. *Chemical Engineering*, v. 64, May 1957, p. 298-306.

Physical and mechanical properties of nickel and nickel alloys at high temperature. (Q general, P general, 2-12; Ni)

586-Q. Improved Methods of Testing the Adhesive Strength of Metallic Coatings on Wires. E. A. Franke. *Engineers Digest*, v. 18, Apr. 1957, p. 151-152. (Translated from *Metalloberfläche*, v. 11, Feb. 1957, p. 53-59.)

Methods of testing metallic coatings of wire; torsion test, rolling test, bending test under tension and impact test. (Q10c, Q general; 4-11)

587-Q. Fatigue Under Triaxial Stress: Development of a Testing Machine and Preliminary Results. J. L. M. Morrison, B. Crossland and J. S. C. Parry. *Institution of Mechanical Engineers, Proceedings*, v. 170, 1956, p. 697-712.

Reasons for attempt to investigate effect of repeated triaxial stresses discussed. In particular the case of the thick cylinder subjected to repeated internal pressure. is con-

sidered. The design and development of a machine capable of repeatedly applying to cylinders internal pressures of the order 20 tons per sq. in. (3,000 atm.) are described in some detail. 5 ref. (Q7f, 1-3)

588-Q. Fatigue Strength of Specimens Containing Cracks. N. E. Frost and C. E. Phillips. *Institution of Mechanical Engineers, Proceedings,* v. 170, 1956, p. 713-725.

Determination of the fatigue limit and the strength reduction factor of cracked specimens. 13 ref. (Q7a, 9-22)

589-Q. Note on the Brittle Intergranular Fracture of Beta-Brass. S. Harper. *Journal of the Institute of Metals,* v. 85, May 1957, p. 415-416.

Stress concentrations at grain boundaries in conjunction with a rapid rate of straining are shown to be essential factors in causing intercrystalline failure at high temperatures. 6 ref. (Q26s, M27f; Cu-n)

590-Q. Behaviour of Fractured Copper Fatigue Specimens on Annealing. D. S. Kemsley. *Journal of the Institute of Metals,* v. 85, May 1957, p. 417-420.

Specimens covering a considerable portion of the S/N diagram were annealed at constant temperature and heating rate. Hardness, metallographic and X-ray diffraction observations were made at certain stages during annealing. Explanation of results. 15 ref. (Q7, J23; Cu)

591-Q. Crack Paths in Fatigued Copper. D. S. Kemsley. *Journal of the Institute of Metals,* v. 85, May 1957, p. 420-421.

Study of transcrystalline and intercrystalline fatigue cracks on rotating-cantilever fatigue specimens of high-conductivity copper (99.95%) 10 ref. (Q7, 1-10; Cu)

592-Q. Effects of Solid Solution Alloying on Creep Deformation of Aluminum. Gordon D. Gemmell and Nicholas J. Grant. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 417-423.

Effect of solid solution alloying on creep-rupture properties, deformation characteristics, ductility and fracture of pure aluminum. Study by means of creep-rupture tests of aluminum alloy containing copper, zinc or magnesium heated to 500, 700 and 900° F. 10 ref. (Q3m, Q23, 1-10; Al)

593-Q. Strain Induced Transformation in Beta Brass. T. B. Massalski and C. S. Barrett. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 455-461.

X-ray and metallographic study of transformation of beta phase of copper-zinc and copper-zinc-gallium alloys upon cold working at low temperatures. Data on new structures formed, on densities of stacking faults, temperature range on which transformation can be induced and on tendency to revert. 20 ref. (Q24m; Cu-n, Zn, Ga)

594-Q. Crack Propagation in the Hydrogen-Induced Brittle Fracture of Steel. W. J. Barnett and A. R. Troiano. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 486-494.

Mechanism of static fatigue fracture investigated with SAE-AISI 4340 steel heat treated to various strength levels with hydrogen introduced by cathodic charging. Placed under static stress and crack growth and propagation studied by heat tinting, metallographic sectioning and electrical resistance measurements. (Q26s, Q7; AY)

595-Q. Deformation of Magnesium Single Crystals by Nonbasal Slip. Robert E. Reed-Hill and William D. Robertson. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 496-502.

Magnesium single crystal oriented to suppress basal slip and twinning strained in tension parallel to basal plane at 190, 25, 150 and 286° C. and at two strain rates; determined and analyzed yield stresses at the four temperatures; microscopic and X-ray analyses used to determine primary modes of slip. (Q24a; Mg, 14-11)

596-Q. Effect of Temperature on the Flow Stress and Strain-Hardening Coefficient of Magnesium Single Crystals. Hans Conrad and W. D. Robertson. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 503-512.

Determines stress-strain curves for magnesium single crystals by incremental tensile creep test in temperature range of 78 to 364° K. and direct shear test at 298 and 364° K. Develops expression from data relating strain rate to applied stress, temperature, activation energy and strain hardening coefficent. 39 ref. (Q25n; Mg, 14-11)

597-Q. Comparison of the Strength of Sintered Carbides. Joseph Gurland. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 512-513.

Note on traverse rupture strength, hardness and density of sintered compacts of carbide with cobalt added. Includes tungsten carbide, titanium carbide, tantalum carbide, columbium carbide, vanadium carbide and zirconium carbide. (Q27a, Q29n, P10a; W, Ti, Ta, Cb, V, Zr, 6-19)

598-Q. HM21XAT8 — New High Temperature Magnesium-Thorium Alloy. *Light Metal Age,* v. 15, Apr. 1957, p. 24-26.

Data on stress-strain relationship in longitudinal and transverse directions, creep properties at elevated temperatures, forming and drawing properties, weldability and corrosion resistance for sheet material of magnesium-thorium alloy. (Q general, K9s, R general, 1-12; Mg, *Th*)

599-Q. Hardness-Tensile Relationships for High Strength Aluminum Alloys. R. E. Kleint and G. B. Mathers. *Light Metal Age,* v. 15, Apr. 1957, p. 30-35.

Data on relationship of tensile strength of 7075 aluminum alloy with hardness values by Rockwell, Riehle, Brinell, Magnatest, Ernst and Barcol tests on "over-age" specimens; comparison of these values with those obtained on specimens with "quench delay" heat treatment. (Q29, Q27, 2-14; Al, SGB-a)

600-Q. Accurate Measurement of Wear Scars on Cutting Tools. J. Taylor. *Machinery,* v. 90, Apr. 26, 1957, p. 927-934.

Methods of measuring machine tool wear with particular reference to methods for wear measurements by microscopes; description of wear scar planimeter and examples of data obtained with it. (Q9n, 1-4, T6n)

601-Q. Flakes in Alloy Steel. F. Feeg. *Metal Treatment and Drop Forging,* v. 24, May 1957, p. 201-204. (Translation from *Radex-Rundschau,* no. 1, 1957.)

Role of hydrogen in formation of flakes or hairline cracks and methods of prevention. (Q26; AY, *H,* 9-20)

602-Q. Further Developments in the Precision Measurement of Diamond Indentors for Rockwell Hardness Testing. F. R. Tolmon and Joyce F. Hall. *Microtecnic,* v. 11, no. 1, 1957, p. 36-46.

How the geometrical form of diamond indentors used in Rockwell hardness testing is examined at the National Physical Laboratory to a high degree of accuracy, mainly by the use of interferometry. Illustrations show that the form of an indentor, including its surface finish, is closely reproduced in the indentation. 1 ref. (Q19c, .1-3, S15)

603-Q. Metallography of a Medium Carbon Steel Subjected to Slow and Impact Compression. J. D. Campbell, J. Duby and K. E. Puttick. *Philosophical Magazine,* v. 2, 8th Ser., Apr. 1957, p. 548-553.

Specimens of medium-carbon steel subjected to slow and dynamic compression examined by optical and electron microscopy; in slow deformation, coarse slip in ferrite occurs in very narrow regions on corrugated surfaces; this behavior appears to be related to the presence of an aging precipitate. 7 ref. (Q24a, M27; CN)

604-Q. Hardness Traverses on Fractured Copper Rotating Cantilever Fatigue Specimens. D. S. Kemsley. *Australian Aeronautical Research Laboratories,* Report ARL/MET. 19, Nov. 1956, 10 p.

In general, the hardness did not rise continuously from each end of the specimen to the point of maximum stress, as expected, but increased to two maxima on either side of this point, and then decreased in the vicinity of the fracture. The extent of this decrease depended on stress and frequency of testing. The hardness at fracture of all specimens fell within a relatively narrow range. 11 ref. (Q29c; Cu)

605-Q. On the Nature of Temper Brittleness in Pearlitic Steels. V. I. Prosvirin and E. I. Kvashnina. *Henry Brutcher Translation* No. 3732, 6 p. (From *Metallovedenie I Obrabotka Metallov,* v. 2, no. 2, 1956, p. 34-49.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 422-Q, 1956. (Q26s, Q22, J29, AY)

606-Q. Hot Strength High-Chromium Steels for Service at 550-600° C. (1020-1110° F.). L. Ya. Liberman and A. V. Boeva. *Henry Brutcher Translation* No. 3811, 10 p. (From *Metallovedenie I Obrabotka Metallov,* v. 2, no. 6, 1956, p. 16-25.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 868-Q, 1956. (Q general, J general, M27; SS)

607-Q. Effect of Residual Stresses Upon the Fatigue Strength of Shafts Carrying Tight Sleeves. I. V. Kudryavtsev and N. M. Savvina. *Henry Brutcher Translation* No. 3847, 7 p. (From *Metallovedenie I Obrabotka Metallov,* v. 1, no. 5, 1955, p. 17-23.)

Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 218-Q, 1956. (Q7, Q25, J28; ST)

608-Q. Elimination of High Brittleness From Hot-Rolled Transformer Sheet. V. A. Koroleva and M. I. Sherstyuk. *Henry Brutcher Translation* No. 3848, 4 p. (From *Stal'*, v. 16, no. 6, 1956, p. 545-548.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 788-Q, 1956. (Q26s, N8, J23; SGA-p)

609-Q. Influence of Some Alloying Elements on the Susceptibility of Steel to Temper Embrittlement. M. L. Bernshtein. *Henry Brutcher Translation* No. 3855, 6 p. (From *Metallovedenie I Obrabotka Metallov*, v. 2, no. 9, 1956, p. 25-30.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 1047-Q, 1956. (Q26s; ST)

610-Q. Measurement of Residual Stresses in Railroad Car Wheels. H. Bühler. *Henry Brutcher Translation* No. 3859, 8 p. (From *Eisenbahntechnische Rundschau*, v. 5, no. 7, 1956, p. 281-288.) Henry Brutcher, Altadena, Calif.

Application of boring-out and turning method for recording the changes in the stress state brought about by dimensional changes of wheels during actual service; disappearance of radial stresses in wheels and coming-off of tires even under normal loads. Composition, mechanical properties and surface roughness of various parts of wheels. Applicability of method to effects of hardening of wheel flanges. (Q25h, T23p; ST)

611-Q. Reagents for Evaluating Susceptibility to Temper Brittleness in Steel. F. M. del Corral and J. M. B. de Castro y Mosquera. *Henry Brutcher Translation* No. 3878, 3 p. (From *Instituto Del Hierro Y Del Acero*, v. 9, Special No. 45, Apr. 1956, p. 478-480.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 724-Q, 1956. (Q26s, M21, ST)

612-Q. Fatigue Strength of Steel Plates With Welded-On Inserts. I. V. Kudryavtsev and N. A. Balabanov. *Henry Brutcher Translation* No. 3894, 5 p. (From *Svarochnoe Proizvodstvo*, no. 6, June 1956, p. 1-5.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 717-Q, 1956. (Q7, J23; ST)

613-Q. Method of Recording True Stress (Strain) Diagrams at Elevated Temperatures. V. V. Merekina. *Henry Brutcher Translation* No. 3915, 2 p. (From *Zavodskaya Laboratoriya*, v. 22, no. 12, 1956, p. 1491-1492.) Henry Brutcher, Altadena, Calif.

Determination of true stresses at elevated temperatures by testing a series of specimens, the first of them taken to failure and the rest only to certain strains; example of a true stress-strain diagram recorded on a ductile alloy at 68 and 390° F. (Q25n, 2-13, 1-4)

614-Q. Effect of Hydrogen on the Mechanical Properties of Steel. P. V. Skuev, L. I. Kvater and V. E. Shapiro. *Henry Brutcher Translation* No. 3931, 7 p. (From *Stal'*, v. 16, no. 10, 1956, p. 909-915.) Henry Brutcher, Altadena, Calif.

Behavior (especially diffusion) of hydrogen present in steel as a solid solution, in molecular form, and probably as compounds, and its effect on reduction of area, elongation and impact values. Effect of aging time and steel structure on hydrogen content and ductility. Effect of plastic deformation; embrittling action of hydrogen as a factor in flaking, with specific reference to the heat treatment of large forgings. (Q general, 1-10; ST, *H*)

615-Q. (English.) **On the Mechanism of the Internal Friction Peaks Associated With the Stress-Induced Diffusion of Carbon in Face-Centered Cubic Alloy Steels.** Ke T'ing-Sui and Tsien Chih-Tsiang. *Scientia Sinica*, v. 5, Dec. 1956, p. 625-643.

Internal friction peaks associated with the stress-induced diffusion of carbon were observed in four kinds of face-centered cubic manganese steel which contain 18.5, 25.4, 36.0 and 9.5% (with 8% of Ni and 3% of Cr) of Mn respectively. The optimum internal friction occurs at a temperature around 250° C. when the frequency of vibration is about 2 cycles per sec. Experimental results showed that the height of internal friction peak is linear with the carbon content in solid solution. 13 ref. (Q22, N1; AY)

616-Q. (English.) **Internal Friction Peak Associated With the Stress-Induced Diffusion of Carbon in Low-Carbon Alloy Martensite.** Ke T'ing-sui and Ma Ying-Liang. *Scientia Sinica*, v. 6, Feb. 1957, p. 81-90.

Internal friction in hardened low-carbon nickel steel was measured with a torsion pendulum and an internal friction peak was observed around 155° C. with a frequency of vibration of about 2 cycles per sec. The condition for the appearance of this internal friction peak is that the steel specimens contain martensite, alloying element and carbon. 9 ref. (Q22, N1; AY, *Ni*, *C*)

617-Q. (French.) **Contribution to the Study of the Mechanical Characteristics of Unalloyed Gray Iron With Laminated Graphite.** Michel Ferry. *Fonderie*, no. 136, May 1957, p. 209-224.

Influence of the matrix and graphite on density, hardness, modulus of elasticity and tensile strength. Practical effects of chemical composition, thickness of the pieces, cooling rates and temperature of casting on the same mechanical characteristics. 27 ref. (Q general, E11; CI)

618-Q. (French.) **Errors in Reading Diameters in the Brinell Hardness Test.** C. Chaussin. *Metallurgie et la Construction Mecanique*, v. 89, May 1957, p. 477.

The Brinell test is open to two main errors: one as to the diameter of the imprint, the other as to that of the ball. The influence of the latter is comparatively small. (Q29b, 1-4)

619-Q. (French.) **Reduction of the Coefficient of Friction by Means of Molybdenum Disulphide.** Pierre Bessiere. *Metaux-Corrosion Industries*, v. 32, Apr. 1957, p. 149-161.

Properties and uses of molybdenum disulphide as a lubricant under varying conditions of speed, pressure and temperature and in association with phosphated surfaces; factors influencing friction and wear with solid lubricants; use of molybdenum disulphide as anticorrosive lubricant; consideration of further applications. 42 ref. (Q9p; NM-h)

620-Q. (German.) **Cross Slip in Copper.** Guido Bassi. *Zeitschrift für Metallkunde*, v. 48, Apr. 1957, p. 190-192.

Spectroscopically pure copper was slightly compressed and annealed at 200° C. for long periods. It was found that cross slip increased with the number of cycles and became irregular. This is thought to be due to the increasing number of vacancies. (Q24a; Cu)

621-Q. (German.) **Deformation of Copper Single Crystals by a Combination of Tension and Torsion.** Hans Rebstock. *Zeitschrift für Metallkunde*, v. 48, Apr. 1957, p. 206-219.

Experiments on copper crystals were carried out to check the dislocation mechanism proposed for the three stages of the stress-strain curve of cubic face-centered crystals. The assumed influence of latent slip systems during Stage 2 was tested in particular by an investigation of the effect of an intermediate torsion of single crystal tubes on work hardening and slip lines. The results agree with the theory that during Stage 2 the activity of latent slip systems creates obstacles which impede slip in the main system by an elastic interaction. Effects in Stage 3 can be understood on the basis of cross slip of screw dislocations. 54 ref. (Q24; Cu, 14-11)

622-Q. (Japanese.) **On the Fracture of Metals (1st Report).** Masui Uemura. *Japan Society of Mechanical Engineers, Transactions*, v. 23, Mar. 1957, p. 142-147.

A phenomenological fracture hypothesis is presented on the premise that generally two fracture stress surfaces for ductile shear fracture and brittle tension fracture in metals exist. The two major factors, triaxiality of stress and plastic strain up to fracture, are formulated into this criterion using the linear invariant of stresses and quadratic invariant of strains respectively. 25 ref. (Q26r)

623-Q. (Japanese.) **On the Erichsen Test of Metallic Sheets—When Narrow Specimens Are Used.** Takeo Yoshizawa. *Japan Society of Mechanical Engineers, Transactions*, v. 23, Mar. 1957, p. 225-229.

The Erichsen test using narrow specimens (less than 70 mm. wide) was made to determine the accuracy of Erichsen value. (Q23q, 1-4; 4-3)

624-Q. (Japanese.) **Stress Distribution and Friction Coefficient in Cold Rolling of Aluminum Plates.** Jiro Wada, Masanobu Sasagawa and Kengo Nakamura. *Light Metals*, v. 7, Mar. 1957, p. 11-15.

A new apparatus for measuring stress distribution and dynamic friction coefficient in cold rolling of aluminum plates consists of a small tungsten pin which is set along the radius direction of the under roll, and a wire strain gage which changes with deformation of the small pin. The wire strain gage is sufficiently sensitive for a small load, as the bobbin of the gage is made of bakelite cloth. With the apparatus a series of experiments was carried out to clarify rolling stress distribution, stick-slip and dynamic friction coefficient in cold rolling of aluminum plates. (Q25, 1-3, F23, 1-17; Al)

625-Q. (Japanese.) **Report on Mechanical Properties of Duralumin Pre-**

served for a Long Period. Hiroshi Asada, Jiro Wada and Yasuhiro Horiguchi. *Light Metals,* v. 7, Mar. 1957, p. 37-43.

The test pieces were preserved in a basement storage room until 1934 without any protection; since then they have been preserved in a steel locker in an ordinary room. After 28 years, tensile strength has become more or less lower and elongation more or less higher. (Q27a; Al)

626-Q. Static Properties of Several High-Strength Steels. E. P. Klier, B. B. Muvdi and G. Sachs. *American Society for Testing Materials,* Preprint 68, 1957, 14 p.

Investigation of the notch properties of high-strength steels. These depend on the following factors: (*a*) strength level, (*b*) orientation, (*c*) composition, (*d*) eccentricity of the load, (*e*) section size and (*f*) stress concentration. 13 ref. (Q23s; ST, SGB-a)

627-Q. Tensile and Creep Properties of Tungsten at Elevated Temperatures. J. W. Pugh. *American Socitey for Testing Materials,* Preprint 71, 1957, 10 p.

Tungsten has been shown to be stronger than other representative refractory metals in short-time tension tests from room temperature to 2000° F. The margin of its superiority in this respect is proportional to its higher melting point. 9 ref. (Q27a, Q3m, 2-12; W)

628-Q. Determination of Strain-Hardening Characteristics by Torsion Testing. D. S. Fields and W. A. Backofen. *American Society for Testing Materials,* Preprint 84, 1957, 13 p.

The conventional analysis of plastic torsion in a cylindrical specimen has been generalized to include rate-sensitive materials. 9 ref. (Q1, N7e)

629-Q. Effect of Cold Work on Elevated Temperature Properties of Types 301, 305, and 310 Stainless Steels. R. A. Lula, A. J. Lena and H. M. Johnson. *American Society of Mechanical Engineers Transactions,* v. 79, May 1957, p. 921-926.

Elevated-temperature strength of AISI Types 301, 305 and 310 stainless steels can be improved by cold working, provided extensive recrystallization during exposure does not take place. (Q27a, 2-12, 3-18; SS)

630-Q. Improving Titanium Wear. H. A. Pray, P. D. Miller and R. Jeffery. *Battelle Technical Review,* v. 6, June 1957, p. 14. (CMA)

The galling tendency of titanium and titanium alloys was reduced by producing a conversion coat with immersion baths containing 50 g. per l. of Na_3PO_4 and 20 g. per l. KF in hydrofluoric acid of differing concentrations. The more acidic baths give coats that are better at 25° C. An anodic coating produced from a NaOH bath is also very good. These coats are removable on pickling with HNO_3-HF baths. The highly wear resistant coats produced by heat treating at 800° F. are more difficult to remove. (Q9n, L14b; Ti)

631-Q. Cast Iron Tests and Specifications. *British Foundryman,* v. 50, Mar. 1957, p. 131-142.

Tensile tests studied and attempts made to overcome difficulties arising from effect of section thickness on strength; for transverse tests, recommends higher scale of loading tests and considerable modification of the deflection figures. 8 ref. (Q27, 1-4; CI)

632-Q. Some Features of the Metallurgical Properties of Steel Castings. W. J. Jackson. *British Foundryman,* v. 50, Apr. 1957, p. 211-219.

Effect on ductility of cast steel of sulphur, phosphorus, nonmetallic inclusions, dendritic segregation and microporosity; influence of chemical composition and heat treatment on low-temperature impact properties. 25 ref. (Q23p, Q6n, 2-13, 2-10; ST, 5)

633-Q. Detection of Fatigue in Metals. R. F. Hanstock. *British Journal of Applied Physics,* Supplement No. 6, Physics of Non-Destructive Testing 1957, p. S48-S50.

Brief review of fatigue and methods employed or suggested for examining its development. Primary consideration is the assessment of the potential value of these methods as primitive nondestructive tests to reveal fatigue prior to development of serious structural weakness. 13 ref. (Q7, 1-4)

634-Q. Structural Changes and Energy Dissipation During Fatigue in Copper. N. Thompson and N. J. Wadsworth. *British Journal of Applied Physics,* Supplement No. 6, Physics of Non-Destructive Testing 1957, p. S51-S55.

Apparatus and methods used and summary of results of observations made of metallographic and energy dissipation changes occurring during fatigue testing of fully annealed copper. 5 ref. (Q7, 1-3; Cu)

635-Q. Average Mechanical Properties of Steel. H. A. Magnus. *Design News,* v. 12, May 15, 1957, p. 140.

Chart for comparing Rockwell, Brinell, ultimate tensile and yield strength relationships. (Q29n, Q27a, Q23b; ST)

636-Q. Characteristics of Stainless Steels. *Design News,* v. 12, May 15, 1957, p. 141-153.

A "selector chart" intended as a guide in choosing stainless steels. (Q general, S22; SS)

637-Q. Effect of Section Thickness and Microstructure on AZ 91 Magnesium Castings. John K. Dietz. *Foundry,* v. 85, May 1957, p. 171-173.

Study of effect of microstructure and section thickness on tensile properties. Notes variation of properties with heat treatment; plots tensile properties as a function of percentage of pearlitic precipitation and as function of grain size. (Q27a, 2-9, 3-21; Mg, 5)

638-Q. Mechanism of Fatigue Failure in Some Binary and Ternary Aluminium Alloys. P. J. E. Forsyth and C. A. Stubbington. *Institute of Metals Journal,* v. 85, Mar. 1957, p. 339-343. 9 ref.

Metallographic observations of fatigue process in a number of simple aluminum alloys at room, low and elevated temperatures. Process appears to be one of depletion of solute atoms in localized region under action of cyclic stresses. Subsequent plastic deformation concentrated in soft spots in structure produced by depletion. (Q7, M27; Al)

639-Q. Effect of Neutron Irradiation on the Mechanical Properties of Titanium and Zirconium. M. J. Makin and F. J. Minter. *Institute of Metals Journal,* v. 85, May 1957, p. 397-402. (CMA)

Changes in the mechanical properties of neutron-irradiated titanium were an increase in yield stress (by about 8000 psi., at all temperatures within the −195-200° C. range), reduction of the elongation before fracture, and a slightly increased ultimate tensile strength. In irradiated zirconium the yield stress of heavily cold worked zirconium decreased slightly, and the elongation and ultimate tensile strength increased. (Q23b, Q27a, 2-17; Ti, Zr)

640-Q. Frequency Dependence of Ultrasonic Attenuation and Velocity on Plastic Deformation. Akira Hikata and Rohn Truell. *Journal of Applied Physics,* v. 28, May 1957, p. 522-523.

Dependence of ultrasonic attenuation and velocity on plastic deformation in 2S aluminum is compared at two frequencies, 5 and 10 megacycles, and the comparison shows agreement as regards frequency dependence with what one can expect from dislocation damping theory. (Q24, Q22; Al)

641-Q. Tin Is Not a Subversive Element in Gray Iron. J. A. Davis, D. E. Krause and H. W. Lowne. *Modern Castings,* v. 31, May 1957, p. 96-98.

Effect of tin additions on the mechanical properties and microstructures of hypo-eutectic and hypereutectic cast gray iron. Tin additions acted as stabilizer of pearlite and slightly improved mechanical properties with tin content up to 0.10%. (Q general, M27, 2-10; CI-n, *Sn*)

642-Q. Creep and High Temperature Alloys. R. W. Guard. *Steel,* v. 140, May 22, 1957, p. 108-118.

General picture of creep behavior; balancing of alloy composition to obtain right amount of dispersed phase in grain boundaries, dispersed or precipitated particles within grains themselves and proper solid solution strengthening. (Q3m, M27d; SGA-h)

643-Q. Properties of Large Steel Forgings. Edward A. Loria. *Steel Processing and Conversion,* v. 43, Apr. 1957, p. 193-198.

Transverse mechanical properties of large steel forgings; their relation to ingot size, forging reduction, transverse reduction of area and original ingot heterogeneities such as dendrite patterns, banding and nonmetallic inclusions. 12 ref. (Q general; ST, 4-1, 9-19)

644-Q. (Czech.) **Influence of Some Factors on the Relaxation in Material at Elevated Temperatures.** Lubomir Cizek. *Hutnické Listy,* v. 12, Apr. 1957, p. 335-342.

The temperature and the initial stress have the most pronounced influence on relaxation; examines, by the relaxation bending method, the influence of some surface layers formed by the diffusion process on the same size chromium-tungsten-vanadium rings. (Q3m, 2-12, Ni; Cr, W, V)

645-Q. (French.) **Better Resistance to Wear by Improving Friction Characteristics.** *Pratique des Industries Mecaniques,* v. 40, Feb. 1957, p. 51-53.

Improvement of geometry of surface condition; "internal" or chemical transformation of surface condition; lubrication. (Q9p, 18-23)

646-Q. (German.) **Influence of Sub-Zero Temperatures and Notches on Static Strengths of Welded Aluminium**

Alloy Sheet. F. Erdmann Jenitzer. *Aluminium*, v. 33, June 1957, p. 376-384.

Use of aluminum for making storage and transport tanks for liquid oxygen requires exact information about the mechanical properties of Al-Mg alloys, of good welding properties, at temperatures down to that of liquid air (−183° C.). Results of investigations of static strengths of 1.5-mm. thick (1/16-in.) oxy-acetylene butt welded sheets in Al-Mg 5, Al-Mg-Mn, and two Al-Mg_2Si alloys, which are noted for their ability to be welded crack-free in small thicknesses. An alloy containing 3% magnesium, 0.65% silicon, 0.62% manganese, 0.35% iron, 0.05% copper proved particularly suitable. (Q27a, K9s; Al)

647-Q. (Russian.) **Influence of High Temperature and Introduction of Magnesium on the Properties of Cast Iron Containing Spheroidal Graphite.** E. E. Farafonov and M. S. Kolmakova. *Liteinoe Proizvodstvo*, no. 3, Mar. 1957, p. 14-16

Laboratory observations on the change of mechanical characteristics with diminishing temperature and assimilation of magnesium. Reduction in the quantity and size of graphite inclusions, and increase of pearlitic inclusions were noted. (Q general; CI-r, Mg, AD-p, 9-19)

648-Q. Yield Phenomenon in Face-Centered Cubic Single Crystals. P. Haasen and A. Kelly. *Acta Metallurgica*, v. 5, Apr. 1957, p. 192-199.

Experiments and correlation with other workers on yield point in the stress-strain curves of single crystals of pure aluminum and nickel. (Q25n; Al, Ni, 14-11)

649-Q. Reports on Fatigue Failures. International Institute of Welding. Commission 13: Fatigue Testing. *British Welding Journal*, v. 4, May 1957, p. 231-238.

Examples of fatigue failures occurring in service in welded constructions with information as to nature and type of weld, weld dimensions and process of fracture in axle arm of washing machine, front axle of truck, welded press frame and stainless steel mixture arm. (Q7b; ST, 7-1)

650-Q. Torsion-Testing Machine for Spot Welds. T. M. Roberts. *British Welding Journal*, v. 4, May 1957, p. 243-245.

Power-operated testing machine produces continuous graphical record of torque load and angular deflection from commencement of loading to failure of specimen. (Q1, 1-2; 7-1)

651-Q. Effect of Calcium Cyanamide on Alloy Cast Irons. Chuyo Hisatsune, Akira Shimizu and Yoshisada Ueda. *Casting Institute of Japan, Journal*, v. 29, Mar. 1957, p. 146-156.

Effect on the mechanical properties with special reference to the tensile strength of alloy cast irons. The tensile strength of alloy cast irons, containing molybdenum, copper or chromium is improved by treatment with calcium cyanamide; strength of alloy cast irons, containing boron, aluminum or titanium, is not increased by the addition of calcium cyanamide; nickel cast irons are little affected by this treatment; on microscopic structures of alloy cast irons, containing molybdenum, copper and chromium, treated with calcium cyanamide, graphite flakes are shorter and pearlite is finer than those of untreated irons. 12 ref. (Q27a; CI-q, AD-p37)

652-Q. Impact Testing of Hard Metals. W. Spaeth. *Industrial Diamond Review*, v. 17, Apr. 1957, p. 65-68, 70.

A new impact tester has been developed which measures not only the energy absorbed by the test piece but also the ultimate load reached during the test. This instrument has been used for numerous tests on a wide range of materials, such as plastics, natural and synthetic carbon, ceramic materials. 5 ref. (Q6, 1-3)

653-Q. Effect of Alloying Elements on Tensile Strength. J. Glen. *Iron and Steel*, v. 30, June 8, 1957, p. 295-312. (CMA)

True stress-strain tensile measurements were performed over a range of temperatures to determine the effect of a number of alloying additions on steel. Adding enough vanadium or titanium suppresses the strain-aging phenomenon at 200° C. since interstitial carbon or nitrogen are firmly fixed adjacent to the vanadium or titanium atoms. A stress maximum was obtained at 400-500° C., and this is considered unusual. Molybdenum has very little effect on the strain-aging phenomenon at 200° C., even allowing for the greater atomic weight. The possibility of molybdenum increasing the solubility of carbon and nitrogen is noted. (Q27a, 2-10, N7e; ST)

654-Q. Microhardness Penetration Curves in Two Nickel-Bearing Carburized Steels. Henry M. Otte. *Iron and Steel Institute, Journal*, v. 186, May 1957, p. 13-21.

Studies made on two pack-carburized air cooled or water quenched nickel-bearing steels with a diamond pyramid microhardness tester of variation in hardness with depth; values obtained related to amount of retained austenite and carbon content; microhardness values found were equivalent to those obtained with standard tester. 20 ref. (Q29q, 2-14; AY, *Ni*)

655-Q. Effect of Alloying Elements on the High-Temperature Tensile Strength of Normalized Low-Carbon Steel. J. Glen. *Iron and Steel Institute, Journal*, v. 186, May 1957, p. 21-48.

Study of the effect of individual alloying elements in steels made with and without aluminum additions; elements investigated include manganese, chromium, molybdenum, tungsten, vanadium, titanium, silicon, nickel and copper. 18 ref. (Q27a, 2-12, 2-10; CN, AY)

656-Q. Contribution to the Study of Anomalies in the Internal Friction of Iron Due to the Presence of Nitrogen in Solution. L. Guillet and P. Gence. *Iron and Steel Institute, Journal*, v. 186, June 1957, p. 223-226.

Behavior of a low-carbon steel when subjected to cyclic stresses at various temperatures is studied. Peak values of internal friction are related to resonant oscillation of nitrogen atoms in the alpha-iron lattice. Critical temperatures for maxima in internal friction at frequencies from 322 to 15,000 cycles per sec. determined. Comparison made between calculated and experimental values of relaxation time for range of temperature studied. 8 ref. (Q22; CN, *N*)

657-Q. Friction in Cold Rolling. G. T. van Rooyen and W. A. Backofen. *Iron and Steel Institute, Journal*, v. 186, June 1957, p. 235-244.

Experiments were carried out in a two-high mill with 6-in. diam. by 10-in. long hardened steel rolls operating at 25 ft. per min.; test material was 2S-18H aluminum. Coefficient of friction along arc of contact was determined using a roll containing two small pins installed at right angles to roll axis, one in a radial direction, the other inclined to the first in an oblique direction. From ratio of stress in the oblique and radial directions, coefficient of friction could be computed as a function of position in the roll gap. Further data about friction over contact arc were derived from distortion of a fine grid machined on strip surface prior to rolling. 17 ref. (Q9p, F23, 1-17)

658-Q. Effect of Ordering on the Slip Patterns of Deformed Ni_3Mn Alloy. Tadami Taoka and Ryukichi Honda. *Journal of Electron Microscopy*, v. 5, (Annual Edition) 1957, p. 19-22.

An essential difference between slip patterns in an ordered state and that in a disordered state of Ni_3Mn alloy was observed, namely an elementary structure in the former with the usual coarse slip in the latter, as in the case of Cu_3Au alloy. The two types of slip patterns indicate two different mechanisms of plastic deformation, in the different states of order in these alloys. 7 ref. (Q24a, N10; Ni, Mn)

659-Q. Prot Fatigue Study of an Aircraft Steel in the Ultra High Strength Range. P. W. Ramsey and D. P. Kedzie. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, Apr. 1957, p. 401-406.

Determines the relationship between fatigue and tensile properties using the Prot progressively increasing load method for a nickel-chromium - molybdenum - vanadium steel in the 150 to 280 ksi. tensile strength range. Comparison with conventional fatigue tests and study of hardness, microstructure and inclusions. 10 ref. (Q7e, Q27a; AY)

660-Q. Nucleation of Dislocation Loops by Cracks in Crystals. J. J. Gilman. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, Apr. 1957, p. 449-454.

Observes etched pits produced by chemical reagents at dislocations in lithium fluoride in positions in front of cleavage cracks as it passes through crystal. Finds that dislocation loops are nucleated ahead of slowly moving cleavage cracks in dislocation-free regions. Studies stability of loops at room and higher temperatures and under stress. 14 ref. (Q26n, M26b, N2)

661-Q. Cleavage Steps and the Cleavage Plane in Chemically Embrittled Cu_3Au Single Crystals. Robert Bakish. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, Apr. 1957, p. 494-495.

Note on brittle behavior and appearance of cleavage face upon bending of embrittled Cu_3Au crystals normal to (110) plane. (Q26n, Q26s; Cu, Au, 14-11)

662-Q. Effect of Strain and Temperature on the Yielding of Copper and Nickel. J. H. Frye, J. L. Scott and J. W. Woods. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, May 1957, p. 708.

Tensile tests with copper and nickel specimens show linear relationship between yield stress and temperature when internal structure remains constant. 9 ref. (Q27, Q23b, 2-11, 3-18; Cu, Ni)

663-Q. New Ultra High Strength Steel. Samuel J. Rosenberg and Carolyn R. Irish. *Materials and Methods,* v. 45, May 1957, p. 145-146.

Mechanical properties of a high silicon-titanium modification of 4340 steel which retains ductility for structural applications when heat treated to 285,000 psi. (Q general; AY, SGB-a; AY)

664-Q. Aluminum-Tin Bearings — High Tin Types Reduce Wear. E. C. Ellwood. *Materials and Methods,* v. 45, June 1957, p. 110-113.

Mechanical properties of aluminum-tin alloys and the effect of small copper additions and heat treatment on them; structure, fatigue and wearing properties; methods of bonding aluminum-tin alloys to steel. 7 ref. (Q9n, Q7a, 2-10, L22; SGA-c, Al, Sn)

665-Q. How to Distinguish Brittle From Tough Steel. Herman Greenberg. *Metal Progress,* v. 71, June 1957, p. 75-81.

To insure freedom from brittle failure in service, steel should have a "nil-ductility transition (NDT) temperature" below its minimum working temperature. At temperatures below NDT, samples with a sharp notch break with all-cleavage fracture. (Q23r, Q26s, 1-4; ST)

666-Q. Aircraft Alloys for Thermal Flight up to 1200° F. Over-All Statement of the Problem. Alfred H. Petersen. *Metal Progress,* v. 71, June 1957, p. 97-98.

Predictions based on 40 years history indicate that 1970 aircraft will require an "index"—that is, yield strength divided by density—of 800,000 at 1200° F. The job ahead of metallurgists is indicated by the fact that the best of our present "superalloys" reach only about 450,000 index. (Q27a, 2-12, T24; SGA-h)

667-Q. Aircraft Alloys for Thermal Flight up to 1200° F. Metallurgical Requirements. Leo Schapiro. *Metal Progress,* v. 71, June 1957, p. 98-99.

Discussion of the yield strength required for a material operating at 1200° F. and the "index" (strength divided by density). (Q27a, 2-12, T24; SGA-h)

668-Q. Aircraft Alloys for Thermal Flight up to 1200° F. Material and Processing Requirements. F. R. Kostoch. *Metal Progress,* v. 71, June 1957, p. 100-101.

The forming, heat treating, welding, brazing and corrosion problems of high-strength materials. (Q27a, G general, 17-2; SGA-h, SGB-a)

669-Q. Aircraft Alloys for Thermal Flight up to 1200° F. Titanium Alloys. Robert I. Jaffee. *Metal Progress,* v. 71, June 1957, p. 101-103.

Description of present titanium alloys for aircraft and developments anticipated. Strength properties and possibility of satisfying the "Schapiro index". (Q27a, 2-12, T24, 17-7; Ti)

670-Q. Aircraft Alloys for Thermal Flight up to 1200° F. Steels for Aircraft. R. B. Gunia. *Metal Progress,* v. 71, June 1957, p. 104-105.

Stainless steel is compared with the ideal aircraft metal, particularly as the strength and the "Schapiro index". (Q27a, 2-12, T24, 17-7; SS)

671-Q. Aircraft Alloys for Thermal Flight up to 1200° F. Tool and Die Steels. George A. Roberts. *Metal Progress,* v. 71, June 1957, p. 106-108.

Basic characteristics of toolsteel, and specific alloys particularly suited to aircraft structural applications. (Q27a, 2-12, T24, 17-7; TS)

672-Q. Aircraft Alloys for Thermal Flight up to 1200° F. Superalloys for Airframe Structures. F. Sidney Badger. *Metal Progress,* v. 71, June 1957, p. 109-110.

Properties of present superalloys are discussed and possibilities for improvement are considered. Nickel-base types, cobalt-base and iron-base are compared as to "Schapiro index". (Q27a, 2-12, T24, 17-7; SGA-h, Ni, Co, Fe)

673-Q. Hardness and Its Measurement. Vincent E. Lysaght. *Metal Treating,* v. 8, May-June 1957, p. 2-4, 26-27, 36-39, 42-49.

Definitions and significance of hardness and hardness testing in metallurgy. Discusses Brinell, Rockwell and Diamond Pyramid hardness testing methods; illustrates some new portable and superficial hardness testing machines. (Q29, 1-3)

674-Q. Use of Radioactive Tracers in the Investigation of Wear of Drop-Forging Dies. D. B. Smith, H. Southan and H. A. Whiteley. *Metal Treatment and Drop Forging,* v. 24, Apr. 1957, p. 131-136.

Experiment using radioactive insert in drop forging die for gaging wear through rubbing away and transfer of material. (Q9, W22a; 14-13)

675-Q. Radiographic Inspection of the Structure of Lifting Chains. George A. Holmes and R. Pankowski. *Metal Treatment and Drop Forging,* v. 24, Apr. 1957, p. 143-148.

Radiospectrographic method used for nondestructive testing of the degree of cold work in wrought iron and mild steel lifting chains. Method demonstrated heterogeneity of cold working and found correlation between structure and mechanical stress and between distribution of cold work and brittle fracture in service. (Q24f, Q26s, S13e)

676-Q. Metallurgical Problems in Nuclear Power Plants. Behaviour of Uranium and Plutonium. J. G. Ball. *Metal Treatment and Drop Forging,* v. 24, Apr. 1957, p. 155-158.

Problems encountered by the physical metallurgist in the use of uranium and plutonium include deformation due to temperature changes, irradiation and fission. The problems are complicated by the existence of numerous and complex phases. (Q general, M26, W11p, 17-7; U, Pu)

677-Q. Fatigue Properties of Brasses, Bronzes and Bearing Metals. J. W. Cuthbertson. *Metal Treatment and Drop Forging,* v. 24, Apr. 1957, p. 159-161.

Difficulties in assessment of fatigue resistance in bearings. Methods of increasing fatigue resistance in tin-babbitt alloys and fatigue properties of copper-lead, aluminum-tin, special composition and electrodeposited bearings. (Q7a; Cu, Sn, Al, SGA-c)

678-Q. Can Ultrasonics Speed Fatigue Testing? *Metalworking Production,* v. 101, June 14, 1957, p. 1032.

Experimental high-frequency technique, in process of development by Mullard Research Laboratories, appears to have several advantages over conventional methods, notably drastic reduction of testing time. A difficulty is that fatigue limit is function of frequency, necessitating calibration of machine. (Q7, 1-3, 1-24)

679-Q. Some Observations on the Nature of Fatigue Damage. P. J. E. Forsyth. *Philosophical Magazine,* v. 2, 8th Ser., Apr. 1957, p. 437-440.

Nature of ship bands at the stage when fatigue cracks are forming. 5 ref. (Q7a, Q24c)

680-Q. High-Temperature Stainless. Edward A. Loria. *Product Engineering,* v. 28, Apr. 1957, p. 135-139.

Pertinent structural data on five austenite-type steels and three martensite alloys of the 400 series usable in applications where 600-1400° F. operating temperatures are encountered. Effects of heat treatment and cold reduction included. (Q general, 2-12; SS, SGA-h)

681-Q. How Irradiation Affects Aluminum Alloys. H. H. Hausner. *Product Engineering,* v. 28, Apr. 1957, p. 169-171.

Tensile and yield strength increase considerably. Elongation decreases in many cases, with maximum decrease in annealed specimens, minimum decrease in strain-hardened specimens. Without protective film, irradiation may tend to accelerate corrosion; in presence of oxide film irradiation acts as a further inhibitor. (Q27a, R general, 2-17; Al)

682-Q. Today's Hottest Question: Materials for Use Above 1500° F.? *Steel,* v. 140, May 13, 1957, p. 120-122.

Progress in development of alloys with cobalt, nickel or molybdenum base for high-temperature use. (Q general, 2-12; Co, Ni, Mo, SGA-h)

683-Q. Lubrication. A Study of Its Action in Continuous Metal Deformation. Pt. 1. L. H. Butler. *Steel Processing and Conversion,* v. 43, May 1957, p. 269-275, 285.

Reviews current theories on the mechanism of friction with special emphasis on welding theory concerning aspects of metal transfer and position of shear plane in welded junctions; types of lubricants and theory of lubrication; concept of hydrodynamic, hydrostatic and boundary lubrication; solid lubricants; requirements of lubricant of metal deformation processes. 26 ref. (To be continued.) (Q9p, G general, F general; NM-h)

684-Q. Evaluation of Weld-Joint Flaws as Reinitiating Points of Brittle Fracture. D. C. Martin, R. S. Ryan and P. J. Rieppel. *Welding Journal,* v. 36, May 1957, p. 244s-251s.

Reviews literature on brittle fracture in ship steels and similar materials. Study was made to determine kind of test specimen and apparatus to use for evaluating weld joint flaws. Influence of lack of fusion and cracking in welds on the initiation of brittle fracture; data on effect of flaw dimensions; test temperatures; residual stresses and cyclic loadings. 8 ref. (Q26s, K9r)

685-Q. Factors Affecting the Tensile Properties of Steel Weld Metal. C. M. Wayman and R. D. Stout. *Welding Journal,* v. 36, May 1957, p. 252s-262s.

Comprehensive literature review of effect on the mechanical properties of weld metal, of metal structure and defects, alloying elements, welding technique, residual stresses, heating and cooling rates, normalizing or annealing. Discusses effect of molybdenum, manganese, chromium,

vanadium, nickel, carbon, nitrogen, oxygen, hydrogen, sulphur and phosphorus. 59 ref. (Q27a, K9r, 2-10; ST)

686-Q. True Stress-Strain Properties of Titanium and Titanium Alloys. E. B. Kula and F. R. Larson. U.S. Watertown Arsenal Laboratory, Report 401/259. *U.S. Office of Technical Services,* PB 121833, Sept. 1955, 90 p. (CMA)

Several heats each of five alpha and six alpha-beta titanium alloys were tested for true stress-strain in the mill-annealed and vacuum-annealed conditions. The test range was −196 to 400° C. Chemical compositions and microstructures studied. (Q25n; Ti)

687-Q. Development of a Heat-Treatable Titanium Alloy Having Adequate Formability. H. A. Robinson, et al. U.S. Air Force, Wright Air Development Center, Technical Report 56-545. *U.S. Office of Technical Services,* PB 121942, Jan. 1957, 78 p. (CMA)

Twenty-seven alpha-beta titanium alloys were melted, forged, rolled to sheet and evaluated for formability and heat treatability as sheet alloys. Solution temperature usually had a greater effect than alloy additions on relative formability (as-quenched). The alloy Ti-3Fe-3Mo-2Al was of particular interest and others showed promise. (Q23q, J general, 17-2; Ti)

688-Q. Investigation of the Effects of Hot-Cold Work on the Properties of Molybdenum Alloys. M. Semchyshen and R. Q. Barr. U.S. Air Force, Wright Air Development Center, Technical Report 56-454. *U.S. Office of Technical Services,* PB 121976, Jan. 1957, 126 p. (CMA)

Mo-0.28Cb and Mo-0.50Ti were studied for fabrication variables vs. degree of strain hardening and vs. resistance to softening at high temperatures. At 2400° F. the columbium alloy was the less strain hardened, due to the greater structure stability of the titanium alloy. High-temperature softening was correlated with as-forged hardness. The anomalous higher hardness with higher working temperature is attributed to strain aging.
(Q23a, N7e; Mo)

689-Q. Influence of Hydrogen on Delayed Failure in Titanium Alloys. R. D. Daniels, et al. U.S. Air Force, Wright Air Development Center, Technical Report 57-30. *U.S. Office of Technical Services,* PB 121997, Feb. 1957, 48 p. (CMA)

Notch geometry, strength level, hydrogen concentration and hydrogen distribution appreciably influence the delayed fracture properties of Ti-4Al-4Mn. The hydrogen-induced delayed failure in sharply notched specimens proceeded by the initiation and slow propagation of cracks, with growth being accelerated by increased hydrogen. The rate appeared to be independent of applied stress, but under some stress conditions the room-temperature creep was a complicating factor. High hydrogen concentration promotes early initiation and rates appear to depend on diffusion of hydrogen from the surface. (Q26; Ti, *H*)

690-Q. (English.) **Dispersion in Time Creep Experiments.** W. Stauffer and A. Keller. *Schweizer Archiv,* v. 23, Feb. 1957, p. 43-52.

Long-time creep and time-rupture tests show considerable dispersion owing to testing procedure and the various characteristics of materials tested. A great number of melts have to be submitted to long-time tests to obtain reliable minimum figures. Plotting of all values of creep and time-rupture tests to obtain average and particularly minimum values proved more suitable than evaluation of each melt. 5 ref. (Q3, 1-4)

691-Q. (English.) **Brittle Fracture of Iron and Steel.** N. P. Allen. *Teknisk Ukeblad,* v. 104, May 9, 1957, p. 375-383.

Liability to brittle fracture is to some extent determined by the quality of the steel, and it is necessary to know how to make steels in which the risk of fracture is low, how to insure by tests that the risk is sufficiently low, and what degree of freedom from risk of brittle fracture is necessary in steels intended for structures of various types. 12 ref. (Q26s; Fe, ST)

692-Q. (English.) **Stresses in Rotating Disks With Noncentral Circular Holes.** Hideo Saito. *Tohoku University, Technology Reports,* v. 21, 1957, p. 217-234.

To check centrifugal stresses of rotating machines, stress concentrations were determined mathematically for aluminum disks containing four and six holes. The radius of the circle on which the centers of the holes were arranged was arbitrarily fixed and the sizes of the holes varied. 6 ref. (Q25, 1-4; Al)

693-Q. (English.) **Measurement of Stresses in Rotating Disks With Holes by Bonded Wire Strain Gages.** Hideo Saito. *Tohoku University, Technology Reports,* v. 21, 1957, p. 235-245.

Electric resistance strain gages with an inexpensive slip ring arrangement were used to measure stress distributions in rotating aluminum disks having symmetrically placed noncentral holes of a variety of sizes, locations and configurations. 14 ref. (Q25, 1-4; Al)

694-Q. (French.) **Electronic Recording of Stress-Time and Stress-Strain Diagrams of Metals Under Impact Stresses.** Julien Dubuc and Georges Welter. *L'Ingenieur,* v. 43, Mar. 1957, p. 31-38.

Stresses were measured by a dynamometer and variable resistance electric strain gages fed by a power supply and a special pentode circuit. Strains were measured by a dynamic extensometer using a photoelectric cell. Results of impact tests showed maximum resistance to be higher than in static tests; and that plastic properties, such as elongation and reduction of area at yield point, increase as compared to static values. 11 ref.
(Q6n, Q27a, X29q, 1-3)

695-Q. (German.) **Alloyed Cylinder Cast Iron.** Hans Reininger. *Giesserei-Praxis,* v. 75, Apr. 25, 1957, p. 168-173.

Influence of the alloying elements nickel, chromium, molybdenum, copper, nitrogen and aluminum, antimony, titanium, vanadium, boron and zinc on alloyed cylinder cast iron. 49 ref. (Q general, 2-10; CI-q)

696-Q. (German.) **Importance of Surface Hardening and Internal Tensions in Structural Steel Section.** Heinrich Standinger. *Metalloberfläche,* v. 11, June 1957, p. 200-205.

Surface strength, increased by heat treatment and mechanical forming, is related to existing internal tensions in structural sections. Generally with such surfaces, internal tensions arise which with proper construction also increase fatigue strength. 30 ref. (Q27a, Q7a, 2-14)

697-Q. (Italian.) **Example of Slip on a Crystalline Plane of Low Atomic Density.** M. Paganelli. *Alluminio,* v. 26, Apr. 1957, p. 154-156.

In an artificially aged, moderately deformed 5%Cu-Al alloy, conditions caused by surrounding grains and subgrains formed by previous deformations can promote slipping. 5 ref. (Q24a, M27c; Al, *Cu*)

698-Q. (Italian.) **Influence of Copper Content on Internal Friction in Al-Cu Alloys.** T. Federighi and F. Gatto. *Alluminio,* v. 26, Apr. 1957, p. 157-161.

Experiments on samples taken from extrusions and from cold rolled material showed that even a small quantity (0.25%) of copper causes a noticeable reduction in internal friction, regardless of the purity of the metal and the frequency of vibration of the test piece. In certain cases, a copper content of over 2% causes a slight increase in internal friction. 13 ref.
(Q22, 2-10; Al, *Cu*)

699-Q. (Italian.) **Effect of Cold Working After Quenching on the Natural and Artificial Aging Characteristics of Al-Cu-Mg Alloys.** D. Gualandi and M. Leoni. *Alluminio,* v. 26, May 1957, p. 203-211.

Effects of 0 to 15% cold working were studied. Cold working was found to increase tensile and yield strengths, reduce elongation; to avoid excessive reduction of elongation, degree of cold working should not be more than 10%. 4 ref.
(Q27a, N7e, 3-18; Al)

Corrosion

233-R. Corrosion: Its Implications in Aircraft. Reginald Tate. *Chemistry and Industry,* no. 17, Apr. 27, 1957, p. 506-508.

Survey of aircraft alloys; meaning of corrosion damage in aircraft; corrosion of engine parts and exhaust components. (R general, T24, 17-7)

234-R. Corrosion Research Laboratories. Pt. II. Fulmer Research Institute. H. K. Farmery. *Corrosion Technology,* v. 4, Apr. 1957, p. 125-127.

Functions, facilities and some of the current work of a British research organization. 7 ref.
(R general, A9h)

235-R. Corrosion, Its Causes, Cost and Prevention. W. Harris. *Corrosion Technology,* v. 4, May 1957, p. 162-164.

Brief history of corrosion research and suggested expansion in training programs and cost of corrosion in Great Britain. 13 ref.
(R general, A9, A3, 17-3)

236-R. Corrosion in a Corn Milling Plant. Charles H. Pelton. *Industrial and Engineering Chemistry,* v. 49, May 1957, p. 65A-74A.

Specific corrosion problems with emphasis on selection of materials.
(R general, T29p, 17-7)

237-R. Corrosion and Corrosion Resistant Coatings. J. H. Payne. *Inspection Engineer,* v. 21, Jan-Feb. 1957, p. 2-10.

Examples of corrosion; methods

of corrosion prevention, including metallizing. (R general, L23)

238-R. Corrosion. Pt. I. What It Is; What It Does. George E. Symons. *Water and Sewage Works,* v. 104, May 1957, p. 210-213.

Definitions, phenomena and tests. (R4)

239-R. Current-Voltage Relationship of Galvanic Anode Arrays in Cathodic Protection. L. J. Waldron and M. H. Peterson. *U.S. Office of Technical Services,* PB 121821, Feb. 1957, 19 p. $.50.

Current outputs of five different sizes of galvanic anode arrays used by the Navy for the cathodic protection of ship hulls are described in a Navy research report. In tests, impressed-current sheet steel anodes were substituted for conventional galvanic anodes. It was found that the addition of anodes was more efficient than a moderate separation of anodes in increasing the total current output. (R10d; ST)

240-R. (English.) **Corrosion of Refractory Materials in Melts. Pt. I. Method for Quantitative Measurement of the Dissolution of Refractory Materials in Melts by Use of Radioactive Isotopes.** H. Flood and A. Seltveit. *Det Kongelige Norske Videnskabers Selskabs,* v. 28, no. 27, 1955, p. 150-153.

Small rods of refractory material are irradiated in a uranium pile and then corroded in a melt. The dissolution of the rod is followed by measuring the increase of the radioactivity of the melt. This method makes it possible to examine in a simple way the rate of corrosion as a function of time. 5 ref. (R6m; RM-h, 14-13)

241-R. (French.) **General Report of the Congress.** M. P. Lacombe. *Chimie & Industrie,* v. 77, Apr. 1957, p. 29-32.

Summarizes the main patterns of thought revealed by 24 papers presented at the European Corrosion Congress in November 1956. Present-day tendencies of scientific research into corrosion, industrial applications, modern processes of protection. Fundamental research conducted into corrosion, methods of study, methods of testing, methods of protection, problems of atmospheric corrosion and light alloys. (R general, A9)

242-R. (French.) **New Methods of Studying Corrosion at High Temperature.** J. Brefort and G. Valensi. *Corrosion et Anticorrosion,* v. 5, Apr. 1957, p. 106-111.

Description of a new heat balance with photo-voltaic cell furnishing a sensitivity of 1/10 mg. for a charge of 200 g. with a view to the study of dry rust. Study of corrosion by liquids or saturated vapor by means of the measurement of the electrical conductivity of the residual metal. 12 ref. (R11a, 2-12)

243-R. (French.) **Behavior of Nickel and Nickel Alloys in the Presence of Halogens.** L. Arbellot. *Corrosion et Anticorrosion,* v. 5, Apr. 1957, p. 112-118.

Information on the resistance to corrosion of pure nickel, Monel, Inconel, 18-8 stainless steel and nickel-molybdenum alloys (Hastelloys). Effect of dry and wet halogens, hydrochloric acids, hydrofluoric and solutions of these acids. (R6; Ni, SS)

244-R. (French.) **Corrosion of Cooling Equipment in Refining.** Marcel Prillieux. *Corrosion et Anticorrosion,* v. 5, Apr. 1957, p. 128-130.

Condenser failure in important units due to deep corrosive pitting by water has led to the investigation of the causes of this phenomenon. It seems that this corrosion is due to the weak oxygen content dissolved in the river water used for cooling. (R4a)

245-R. (French.) **New Aspects of the Oxidation of Metals and Alloys at High Temperatures.** J. Benard. *Corrosion et Anti-Corrosion,* v. 5, May 1957, p. 138-145.

Survey of recent findings in this field, concerning on the one hand the existence of a process of nucleation in the origin of the formation of an oxide film, and on the other modifications of the superficial microstructure of the metal after a prolonged period in a very weak oxidizing atmosphere. 20 ref. (R1h, 2-12)

246-R. (French.) **A Case of Biological Corrosion of Hydroelectric Works in Africa and the Action of Organic Products in This Corrosive Process.** P. Colomb. *Corrosion et Anti-Corrosion,* v. 5, May 1957, p. 153-155.

Endeavors to explain the failure of classic bituminous coatings in water pipes in a region of the Belgian Congo. None of the bacteria hitherto known for their corrosive action having been found in the mud deposits, harmful action was attributed to the presence of amino acids which were revealed by chemical and chromatographic analysis. (R1g; 8)

247-R. (French.) **Season Cracking of Brass.** J. M. Pouvreau. *Cuivre Laitons Alliages,* no. 36, Mar-Apr. 1957, p. 41-45.

Consideration of the causes of this phenomenon under five heads: chemical composition of the alloy, existence of internal and external stress, surrounding corrosive atmosphere, sudden variations in temperature and form of the product. Possibilities of controlling this phenomenon and problems involved. (R1d; Cu-n)

248-R. (French.) **Results of Atmospheric Corrosion Tests Effected in Italy on Aluminum and Aluminum Alloys.** Eugenio Hugony and Giuseppe Luft. *Revue de l'Aluminium,* no. 242, Apr. 1957, p. 379-393.

Tests carried out by Instituto Sperimentale dei Metalli Leggeri concerned only aluminum or light alloy assemblies composed of rolled or extruded products, with or without surface protection. Factors taken into account included changes in appearance, reduction of the mechanical properties and alterations in microstructure. 11 ref. (R11, R3; Al)

249-R. (German.) **New View of the Passivity of Stainless Steel.** M. G. Fontana and W. P. McKinnell. *Werkstoffe und Korrosion,* v. 8, May 1957, p. 249-254.

Survey of recent publications on iron and stainless steels; discussion of recent work of the Ohio State University on adsorption of oxygen on stainless steel surfaces at room temperature. 35 ref. (R10c; SS)

250-R. (German.) **Investigations on the Current Density Distribution of Cathodic Protection in Different Soils.** M. Solti. *Werkstoffe und Korrosion,* v. 8, May 1957, p. 256-260.

Experimental cell consisting of a piece of a steel tube and a parallel auxiliary anode was buried in soils of different chemical properties. The cathodic polarization curves were measured by means of the Holler method. The potentials at different spots were measured under certain external current intensities by point source anodes. (R10d, R8)

251-R. (German.) **Tensile Corrosion and the Theory of Tenacity.** K. Matthaes. *Werkstoffe und Korrosion,* v. 8, May 1957, p. 261-277.

The corrosion crack is theoretically a tensile crack like red shortness (weld crack) and the solder crack; the conditions of occurrence of these kinds of cracks are the presence of two different kinds of atoms in the same lattice and the presence of elastic and over-elastic tensions. 81 ref. (R1d, 9-22)

252-R. (German.) **Influence of Light Upon the Corrosion of Iron in Aqueous Solutions.** B. Lovrécek and E. Korkut. *Werkstoffe und Korrosion,* v. 8, May 1957, p. 277-280.

Corrosion rate of steel specimens exposed to light is about 20% higher than that of those not exposed. To clarify the mechanism of this corrosion the potentials of specimens in the same solutions were plotted against time. (R6; Fe)

253-R. (Japanese.) **Action of Heated Water With Surface of Aluminum.** Ichiro Sato. *Electrochemical Society of Japan, Journal,* v. 25, Jan. 1957, p. 8-12.

It is a well-known fact that the formation of boehmite (alpha-Al_2O_3 H_2O) will be seen when aluminum is immersed in hot water at about 80° C. The mechanism of the formation of boehmite was investigated from electrochemical point of view. 10 ref. (R4, 1-16; Al)

254-R. Avoidance of Stress Corrosion in Austenitic Steel Equipment. C. Edeleanu. *Chemical and Process Engineering,* v. 38, May 1957, p. 181-184.

Present state of knowledge of stress-corrosion; corrosion in plant using chloride or caustic solutions and plant using water or steam. 7 ref. (R1d; SS)

255-R. Cyclohexylamine Carbonate as a Volatile Corrosion Inhibitor. C. A. Rhodes. *Corrosion Prevention and Control,* v. 4, Apr. 1957, p. 37-39, 42.

Powerful rust inhibiting action on ferrous metals, with protective action for chromium plate, nickel, Monel metal, lead, zinc and aluminum, even in the presence of water droplets and vapor; closed space necessary to prevent loss of inhibitor vapor; applications include protection of aircraft engines, tin plate, mild steel pans, etc. (R10b)

256-R. Corrosion Research in the USSR. *Corrosion Prevention and Control,* v. 4, Apr. 1957, p. 49-50, 56.

Brief abstracts from Russian research on corrosion of aluminum, Armco iron, carbon steel, cast iron, nickel, copper, lead, stainless steels and tantalum by chlorine; effect of cathodic and anodic polarization to sensitivity of magnesium alloy to corrosive attacks. Corrosion rates of sulphuric acid on zinc and antimony; iron corrosion in alkaline solution. (R6)

257-R. Cathodic Protection in Military Construction. Lindsay M. Applegate. *Military Engineer,* v. 49, May-June 1957, p. 188-191.

A number of installations described and evaluated. (R10d)

258-R. Low pH Receiver Waters Cut Corrosion in a Crude-Oil Unit. And After-Effects Have Been Elimi-

nated. J. A. Diehl and E. A. Schnake. *Oil and Gas Journal,* v. 56, May 20, 1957, p. 157-165.

After 27 months of operation with pH of about 4.3 and inhibition injections at 10 to 15 ppm., after-effects have been eliminated and equipment protected from corrosion. 7 ref. (R4a, T29n)

259-R. How 31 Companies Are Fighting Corrosion in Cat Reforming. E. B. Backensto. *Oil and Gas Journal,* v. 56, May 20, 1957, p. 180-190.

Difficulties are excessive metal loss, heavy scaling of furnace tubes, plugging of catalyst beds and fouling of heater and exchanger tubes. The following preventive steps are being taken: use of proper alloys, desulphurization of feed stock, removal of hydrogen disulphide from recycle gas and aluminizing. 17 ref. (R general, T29r)

260-R. Survey Reveals Reformer Corrosion Data. E. B. Backensto. *Petroleum Refiner,* v. 36, May 1957, p. 201-204.

The most frequently encountered difficulties related to corrosion were excessive metal loss; heavy scaling of furnace tubes, exchangers, and transfer lines; plugging of catalyst beds and fouling of heater and exchanger tubes. Most widely used methods to combat corrosion are given. (R general, T29n)

261-R. Corrosion—What You Can Do About It. D. Kut and S. Kut. *Plant Engineering,* v. 11, May 1957, p. 139-140.

Mechanism and prevention of boiler equipment corrosion. (R4c)

262-R. External Casing Corrosion —Where Is It? How Bad Is It? J. D. Sudbury. *World Oil,* v. 144, May 1957, p. 210-222.

Casing examined to a depth of about 5200 ft., corrosion is described and preventive measures recommended. (R7a)

263-R. (French.) **An Up-to-Date Look at Methods of Fighting Corrosion.** Jean Kettler. *Usines d'Aujourd'hui,* no. 35, p. 79-82.

Review of two methods of combatting corrosion of metals: (1) elimination of harmful agents; (2) protective coatings. (R10a, L general)

264-R. (French.) **Practical Methods of Fighting Corrosion.** *Usines d'Aujourd'hui,* no. 35, p. 87-101.

Properties of commercial products (paints, varnishes, metallic and plastic coatings) for surface protection; engineering firms specializing in corrosion problems; corrosion testing equipment. (R10, R11, L general)

265-R. Oxidation of Hafnium. W. W. Smeltzer and M. T. Simnad. *Acta Metallurgica,* v. 5, June 1957, p. 328-334. (CMA)

Oxidation data for hafnium subjected to 760 mm. of oxygen were obtained for the range 350-1200° C. Data for the range 350-710° C. are plotted according to a logarithmic equation, those for the range 350-800° C. according to a parabolic equation, and those for the range 900-1200° C. according to a linear equation. The respective activation energies for these rate constants are 11.4, 36.0 and 26.1 k-cal. per mole. The formation of a duplex scale (outer porous and inner compact oxides) transforms the rate from parabolic to linear. Monoclinic HfO_2 is the surface oxide. (R2h; Hf)

266-R. Hydrogen Effusion Method for the Determination of Corrosion Rates in Aqueous Systems at Elevated Temperature and Pressure. M. C. Bloom and M. Krulfeld. *Electrochemical Society, Journal,* v. 104, May 1957, p. 264-269.

Apparatus and technique for determining corrosion rate at elevated temperature and pressure from rate of hydrogen effusion; results obtained for low-carbon steel capsules show good reproducibility and compare with independent method. 9 ref. (R11a, R4; CN)

267-R. Galvanic Corrosion. Pt. 1. Current Flow and Polarization Characteristics of the Aluminum-Steel and Zinc-Steel Couples in Sodium Chloride Solution. M. J. Pryor and D. S. Keir. *Electrochemical Society, Journal,* v. 104, May 1957, p. 269-275.

Measurements of current flow, weight loss and polarization carried out on aluminum, mild steel and zinc mild steel couples in normal sodium chloride solutions at 25° C.; aluminum and zinc were anodic to mild steel under wide variety of experimental conditions. 20 ref. (R1a; Al, CN Zn)

268-R. Scaling of 18-8 Stainless Steel in Reheating Furnace Atmospheres. John Olof Edstrom. *Iron and Steel Institute, Journal,* v. 185, Apr. 1957, p. 450-466.

Studies structure of oxide scales formed on 18-8 stainless steels at 1050° C. and in different types of reheating atmosphere by microscopy and X-ray diffraction. Follows conditions for formation of flaky and adherent oxides and presents hypothesis on scaling mechanism. Explanation of varying influence of sulphur in oxidation process in reducing and oxidizing types of atmospheres. 45 ref. (R2q; SS)

269-R. Investigation Into the Catastrophic Corrosion of a Flake Graphite Cast Iron in Carbon Dioxide Containing a Small Amount of Carbon Monoxide. S. R. Billington and B. C. Woodfine. *Metallurgia,* v. 55, May 1957, p. 213-220.

Metallographic data on the oxidation behavior of pearlitic flake graphite cast iron in carbon dioxide and carbon monoxide-carbon dioxide mixtures at temperatures from 375 to 525° C. under gas pressure of approximately 14.5 atm. for time up to 3000 hr.; X-ray and electron diffraction examination of phases present in outer scale; suggested mechanism to account for higher rate of oxidation observed in the carbon monoxide-carbon dioxide mixture at 525° C. 3 ref. (R1h, M27; CI)

270-R. Dissolution of Tungsten in Mixtures of Hydrofluoric and Nitric Acids. D. Robbins. *Metallurgia,* v. 55, May 1957, p. 257-259.

Investigation on solubility of tungsten in mixtures of hydrofluoric and nitric acids. Mixture with 40% nitric and 60% by volume concentrated hydrofluoric acid dissolves metal most readily. (R6g; W)

271-R. Factors in the Selection of Corrosion Resistant Materials. F. L. Whitney, Jr. *Metal Progress,* v. 71, June 1957, p. 90-96.

Ease of fabrication (especially field welding without damage), corrosion rate and cost are most important items, but operating factors —such as temperature, concentration purity and velocity of corrosive fluid, erosion by sludge, concentration cells under adhering solids—are of equal influence on the over-all economics. (R general; SGA-g)

272-R. How Corrosion Attacks Well Casing. Y. W. Titterington. *Oil and Gas Journal,* v. 56, May 27, 1957, p. 136-140.

Cathodic protection has become a reliable and useful method of protecting well casing from external corrosion. Current requirements are determined from either downhole potential-drop surveys or wellhead-current-potential measurements. 5 ref. (R10d)

273-R. Sodium Corrosion and Oxidation Resistance of High-Temperature Brazing Alloys. G. M. Slaughter, C. F. Leitten, Jr., P. Patriarca, E. E. Hoffman and W. D. Manly. *Welding Journal,* v. 36, May 1957, p. 217s-225s.

Testing procedure and results of tests on Inconel T joints, brazed with a large number of commercial and experimental high-temperature brazing alloys to determine resistance to sodium corrosion and high-temperature oxidation; testing time ranged from 100 to 1300 hr. and testing temperatures of 1500 and 1700° F. were used; types of alloys tested included nickel-silicon-boron alloys, nickel-chromium-silicon, nickel - chromium - silicon - boron, nickel-chromium-phosphorus, nickel-phosphorus, nickel-manganese and many others. (R6, K1h; SGA-f)

274-R. Corrosion Test Procedure for the Selection of Crystal Bar Zirconium for Use in Naval Reactor Fuel Elements. V. F. Saitta. *U.S. Atomic Energy Commission,* ANL-4450, May 10, 1950, 11 p. (CMA)

Equipment and a procedure have been developed for the corrosion testing of zirconium for naval reactor elements. The test water is at 600° F. and 1550 psi. for 168 hr. Zirconium bars selected for cover plate material for fuel elements must be coated with a very adherent iridescent surface tarnish; corrosion products must be absent. The test outlined gives reliable and reproducible results. (R11, T11g, 17-7; Zr)

275-R. (French.) **Contribution to the Study of Factors Governing Rupture of Mild Steel Subjected to Tension in a Hydrogen Sulphide Saturated Acid Solution.** Eugene Herzog. *Comptes Rendus,* v. 244, Mar. 11, 1957, p. 1499-1502.

Importance of the nature of carbides on the propagation of ruptures in an acid medium, whether saturated with hydrogen sulphide or not. (R1d, R6g; CN)

276-R. (French.) **Intergranular Corrosion by Hydrochloric Acid on Aluminum Refined by the Zone Melting Process.** Frederick Montariol. *Comptes Rendus,* v. 244, Apr. 15, 1957, p. 2163-2166.

Study of corrosion process on heat treated specimens immersed in a 22% solution of pure hydrochloric acid. 4 ref. (R2h, R6g; Al)

277-R. (French.) **Role of Surface Carburization in Reactions of Organic Vapors on the Surface of Tungsten (Case of Acetaldehyde).** P. Le Goff and M. Letrot. *Journal de Chimie Physique,* v. 54, Jan. 1957, p. 3-14.

Study of decomposition of acetaldehyde and oxidation of tungsten at very low pressure and in a dynamic system. Only substances produced in decomposition are CO, H_2 and free carbon, to the exclusion of all free radicals. Decomposition becomes measurable at 1300° K. and is practically total at 1700° K. 16 ref. (R1h; W)

278-R. (French.) **Electrographic Study of Oxide Films Appearing on Aluminum and Nickel Subjected to an Electric Discharge in a Gaseous Oxygen Medium.** D. V. Ignatov. *Journal de Chimie Physique,* v. 54, Jan. 1957, p. 96-105.

Complexity of conditions of formation of an oxide film in a liquid medium and possibility of a secondary reaction between the oxide and the electrolyte impede accurate study of formation of oxide films. Simplified conditions using an electric field during interaction of oxygen on metal were created in an electric discharge tube in a gaseous medium and permitted basic conclusions on mechanism of oxidation of aluminum and nickel. 4 ref. (R1h, R11m; Al, Ni)

279-R. (French.) **Corrosion of Hulls by Stray Electric Welding Currents.** M. Giannoti. (Translated from "Rivista Marittima", May 1956.) *Navires, Ports et Chantiers,* no. 84, May 1957, p. 350-352.

Characteristics of this type of corrosion; how to identify; preventive measures for both old and new vessels. (R1j, T22g; ST)

280-R. (French.) **Corrosion of Metals by Olein.** M. Loury and C. Defromont. *Revue Francaise des Corps Gras,* v. 3, June 1956, p. 436-444.

Corrosion of oil drums during transport and storage; methods of protecting existing containers; new corrosion resistant containers and types of metals that can be used; effects of olein on various metals; corrosion resistance tests; research on corrosion inhibitors. (R7e, R10b)

281-R. (French.) **First European Congress on Corrosion.** J. L. Rabate. *Technique de l'Eau et de l'Assainissement,* no. 123, Mar. 15, 1957, p. 47-49.

Summary of main points of reports presented to Congress (Paris, 11/18-12/3/56) on the following general themes: Methods of combatting corrosion; corrosion and protection of manufactured objects; economic aspects of corrosion. (R general)

282-R. (Japanese.) **On the Corrosion Resistance of Titanium Alloys.** S. Yoshida, S. Okamoto and T. Araki. *Japan Institute of Metals, Journal,* v. 21, Mar. 1957, p. 183-186. (CMA)

Binary titanium alloys with additions of aluminum, silver, cobalt, chromium, copper, iron, manganese, molybdenum, nickel, silicon, tin and tungsten were corrosion tested as hot and cold rolled plate 1 mm. thick. Corrosion media were the common mineral acids and bases, aqua regia, acetic, formic and oxalic acids and NaCl, $FeCl_3$ and $AlCl_3$ at 25° C. and boiling. Ti-2OMo was highly resistant to hydrochloric acid and sulphuric acid, but less so to nitric acid fhan titanium. Alloying improved the corrosion resistance to organic acids and $AlCl_3$. (R6, 2-10; Ti)

Inspection and Control

288-S. Principal Types of Cast Iron and Broad Spheres of Application. J. G. Pearce. *British Cast Iron Research Assoc. Journal of Research and Development,* v. 6, Apr. 1957, p. 521-529.

Classification of cast irons in relation to mechanical requirements of British Standard specifications covering general gray iron castings, whiteheart and blackheart malleable castings and the nodular cast irons. Reference is made to deleterious effect on castings of certain trace elements present in scrap or raw materials. (S22, 1-10; CI-n, 15-5)

289-S. Applications of X-Ray Emission Spectrometry to Rock and Ore Analysis. G. R. Webber. *Canadian Mining and Metallurgical Bulletin,* v. 50, Apr. 1957, p. 222-227.

General principles of X-ray emission spectrometry; covers sample preparation, procedure and results obtained on analysis of rocks for iron, titanium, calcium and potassium or for columbium. 19 ref. (S11c; RM-n)

290-S. Non-Destructive Techniques in Refinery Inspection. P. W. Sherwood. *Corrosion Technology,* v. 4, May 1957, p. 148-151.

Application in determining survival life of installed equipment which may be exposed to mechanical wear, erosion or corrosion and in locating obstructions which may form in pipelines and other equipment. (S general, Q9, R11)

291-S. Continuous Gauging of Hot-Rolled Steel Strip. *Engineer,* v. 203, Apr. 12, 1957, p. 573-574.

A gamma-ray thickness gage for measuring thickness of hot rolled steel strip as it passes from the rolls. (S14e, F23, 1-16; ST)

292-S. Roughness of Pre-Treated Surfaces. H. Bablik, F. Gotze and E. Nell. *Industrial Finishing,* v. 9, May 1957, p. 582-584.

Investigation into the roughness of various preheated surfaces and its importance for hot dipping. (S15, L16)

293-S. Use of Gamma Rays for Continuous Inspection. A. Kohn. *Iron and Coal Trades Review,* v. 174, May 3, 1957, p. 1015-1018.

Semifinished products at rolling temperatures examined by scintillation counters that measure gamma-ray activity for the detection of cavities. (S13e, X27c, 1-2)

294-S. Automatic Processes in Strip Rolling. S. S. Carlisle. *Metal Industry,* v. 90, May 10, 1957, p. 389-390.

Principles of automatic gage control to single-stand mills and tandem mills. 11 ref. (S14, W23c, 1-2)

295-S. Determination of Copper in Nickel Solutions. Thomas A. Downey. *Plating,* v. 44, Apr. 1957, p. 383-385.

Colorimetric procedure using absorbants of copper, neo-cuproine complex in ethanolchloroform solution for determination of copper. Method successfully used for checking copper in Watts' nickel plating solution. 4 ref. (S11a; L17a; Ni, *Cu*)

296-S. Ultrasonic Flaw Evaluation. W. C. Hitt. *Western Machinery and Steel World,* v. 48, Apr. 1957, p. 95-99.

Summarizes results obtained by 20 companies using step-type reference test block system of flaw evaluation for immeresd ultrasonic testing of extruded and forged materials. (S13g, 1-4; 4-1, 4-8)

297-S. Notes on the Chemical Determination of Nitrogen in Chromium. E. J. Lumley. *Australian Aeronautical Research Laboratories, Metallurgy Note,* ARL/MET. 7, Feb. 1957, 10 p.

The acid solution distillation method. 4 ref. (S11j; Cr, *N*)

298-S. Flame Photometric Determination of Caesium in Bismuth and Bismuth-Uranium Alloy. P. C. Wildy. *British Atomic Energy Research Establishment,* A.E.R.E. C/R 2114, 1956, 11 p.

Method for determination of cesium in bismuth and bismuth-uranium alloy using an image converter flame photometer. The precision over the range 1 to 5% cesium is better than 5% and over the range 0.20 to 1% cesium is approximately 10%. The limit of sensitivity is 0.02%. (S11a; Bi, U, *Cs*)

299-S. Impurity Analysis of Aluminium by Radioactivation and Scintillation Spectrometry. P. Iredale. *British Atomic Energy Research Establishment,* A.E.R.E. EL/M 96, 1957, 13 p.

Specimens of aluminum were irradiated in a flux of thermal neutrons and the identities of those impurities producing γ-rays when activated were established by measurements of γ-ray energy and of half life. In this way small amounts of impurities were detected while avoiding chemical separation. 4 ref. (S11q; Al, 9-1)

300-S. Local Analysis of Welds in High-Alloy Steels and Hot Strength Alloys. A. G. Komarovskii. *Henry Brutcher Translation* No. 3885, 2 p. (From *Izvestiya Akademii Nauk SSSR,* Ser. Fiz., v. 19, no. 2, 1955, p. 152-153.) Henry Brutcher, Altadena, Calif.

Special generator for localized spectrochemical analyses, providing a variety of discharge conditions, such as high-frequency spark, a powerful condensed low-voltage spark, a high-intensity arc discharge on A.C., and the usual arc and spark discharges, by simple switch manipulation. (S11k, 1-3; SS, 1-7)

301-S. Direct Titration of Calcium and Magnesium in Openhearth and Blast-Furnace Slags With the Disodium Salt of Ethylene-Diaminetetracetic Acid. I. N. Bazilevskaya. *Henry Brutcher Translation* No. 3896, 2 p. (From *Zavodskaya Laboratoriya,* v. 22, no. 2, 1956, p. 166-167.) Henry Brutcher, Altadena, Calif.

CaC values obtained on blast furnace slag with disodium salt of ethylene-diaminetetracetic acid as compared with permanganate; and MgO values obtained with and without separation of calcium. (S11j; RM-q, *Ce, Mg*)

302-S. Colorimetric Determination of Phosphorus in 10-20% Chromium Steels. E. A. Nechaeva and E. S. Lapidus. *Henry Brutcher Translation* No. 3897, 1 p. (From *Zavodskaya Laboratoriya,* v. 22, no. 4, 1956, p. 418.) Henry Brutcher, Altadena, Calif.

Simplification and improvement of Kokorin's method for phosphorus in heat resisting steels with 0.015 to 0.035% phosphorus, using a cobalt salt instead of silver as catalyst. (S11a; SS, *P*)

303-S. Spectrochemical Determination of Nitrogen, Hydrogen, and Oxygen in Titanium and Titanium Alloys. N. S. Sventitskii. *Henry Brutcher Translation* No. 3899, 6 p. (From *Zavodskaya Laboratoriya,* v. 22, no. 6, 1956, p. 668-673.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 460-S, 1956. (S11; Ti)

304-S. Application of Objective Photometric Interpolation to the Determination of Elements in High Concentrations in the Spectroanalysis of

Multi-Component Alloys. I. A. Grikit. *Henry Brutcher Translation* No. 3905, 3 p. (From *Zavodskaya Laboratoriya*, v. 22, no. 2, 1956, p. 196-198.) Henry Brutcher, Altadena, Calif.

Possibility of running rapid analyses on a heat of steel or alloy containing up to 18 different elements, by combining subjective (for 10-15 elements in low concentration) and objective (for 2-3 elements in high concentration) photometric interpolation, while the heat is still in the furnace. (S11a; AY)

305-S. Determination of Small Contents of Aluminum in Steel. Pt. II. A. Neuberger and E. Schoffmann. *Henry Brutcher Translation* No. 3934, 2 p. (From *Archiv Eisenhuttenwesen*, v. 28, no. 2, 1957, p. 65-66.) Henry Brutcher, Altadena, Calif.

Adoption of a method of concentration proposed by Zörner and coworkers, to reduce the aluminum loss in authors' caustic soda procedure from 25 to 3% and insure a correspondingly higher accuracy of the aluminum determination. (S11; ST, *Al*)

306-S. (French.) **Quality Control at the Westinghouse Columbus Plant.** *Galvano*, no. 243, Apr. 1957, p. 33-37.

Rigid control is exercised at each stage in the production of Westinghouse refrigerators from the checking of alloy content, tensile strength and surface conditions prior to manufacture to the inspection of all shearing, stamping, forming, welding, finishing, assembly and packing operations. (S general, T10c, G general)

307-S. (French.) **Utilization of Pyrometers in the Founding of Copper Alloys.** *Journal d'Informations Techniques des Industries de la Fonderie*, no. 85, Mar. 1957, p. 5-7.

Arguments for and against the use of pyrometers. Pointers for the precise determination of temperature, the correct moment for casting and the achievement of optimum cleanliness. (S16n, E general; Cu)

308-S. (French.) **Measurement and Control of Temperature in Heat Treatment Plants.** Marcel Boyer. *Trempe*, no. 33, Apr. 1957, p. 21-35.

Survey of pyrometric and thermocouple equipment currently in use: thermo-electric pyrometers, optical pyrometers, electronic pyrometers, thermocouples; function and operation of this equipment. 12 ref. (S16j, S16n, 1-2, J general)

309-S. (Japanese.) **Rapid Quantitative Analysis of Iron in Copper and Copper Alloys.** Tatsuro Murakami. *Japan Analyst*, v. 6, 1957, p. 172-173.

Procedures for spectrographic analysis; effect of temperature and interferences. 5 ref. (S11c; Cu, *Fe*)

310-S. (Italian.) **Some Considerations on the Interpretation of Ultrasonic Examinations.** E. Marianeschi and T. Tili. *Metallurgia Italiana*, v. 49, Apr. 1957, p. 275-289.

Basic theoretical aspects of ultrasonic testing are summarized and discussed; specific acoustic impedance; reflection; scattering; diffraction; simultaneous influence of frequency, acoustic impedance and effect of target size on the intensity of reflected energy. Some experimental results taken from routine inspection are explained with the aid of the above-mentioned theoretical principles. 14 ref. (S13g)

311-S. Ultrasonic Testing of Aluminum Alloys. William L. Fink. *American Society for Testing Materials*, Preprint 74, 1957, 6 p.

The standardization of ultrasonic testing procedures and instruments for the inspection of aluminum alloy products is described with emphasis upon reproducibility and the correction of ultrasonic indications for metal distance and other disturbing factors. Discusses types of discontinuities most commonly encountered in aluminum alloys and the reflection of ultrasound by them. The latter half of the discussion is devoted to the effect of discontinuities on properties with emphasis upon fatigue life. 3 ref. (S13g, Q7b; Al)

312-S. Optical Fluorescence in Non-Destructive Testing. W. A. Runciman. *British Journal of Applied Physics*, Supplement No. 6, Physics of Non-Destructive Testing 1957, p. S34-S36.

Magnetic materials can be tested for irregularities on or near the surface by the fluorescent magnetic particle method. Surfaces of any metal can be inspected for cracks by the fluorescent penetrant method. 7 ref. (S13j; SGA-n, 9-22)

313-S. Effects of Penetrating Radiations on Materials. S. F. Pugh. *British Journal of Applied Physics*, Supplement No. 6, Physics of Non-Destructive Testing 1957, p. S36-S39.

Elementary account of changes produced in solids by irradiation. Advance in understanding this subject will further development of nondestructive testing techniques. 24 ref. (S13e, 2-17)

314-S. Where Betatron Inspection Fits in Metalworking. *Iron Age*, v. 179, Apr. 18, 1957, p. 111-113.

Efficiently designed inspection chamber and betatron equipment allows inspection of more steel castings and helps in working out better casting techniques and designs. (S13e, 1-2; ST, 5)

315-S. Autosonics. *Iron and Steel*, v. 30, Apr. 1957, p. 130-149.

Ultrasonic inspection equipment with automatic monitoring and flaw alarm used in regular production testing at Kelvin-Hughes Ltd. (S13g, 1-2)

316-S. How to Test Tool Steels. H. D. Weckener. *Mechanical World and Engineering Record*, v. 141, May 1957, p. 198-201.

To exercise control over deliveries of toolsteel requires metallographic, physical and technological tests. Results of a great number of tests are presented statistically and the conclusions obtained are discussed. 15 ref. (S12; ST)

317-S. Cascade Control for Strip Annealing. *Steel*, v. 140, June 10, 1957, p. 150-153, 156.

Instrument system on continuous strip annealing line monitors temperature and makes corrections for variables in dimensions and speed. (S14, S16, S18n, J23, 1-11; ST)

318-S. Reveals Test Procedures for Atomic Products. Warren J. McGonnagle. *Steel*, v. 140, June 10, 1957, p. 194-201, 204-209, 212.

Testing methods: ultrasonic transmission, helium leak, penetrants, radiography, electrical resistance, methods, some of which employ eddy current and several visual light-sensitive devices. Explains why reactor parts need nondestructive tests. (S13; T11)

319-S. Problems in Steel Specifications. Development of an AISI-SAE Standard Steel. W. R. Miller. *Steel Processing and Conversion*, v. 43, Apr. 1957, p. 208-210.

Development of the SAE codification system and the standardization of steel grades and development of interchangeability between many AISI and SAE standard steels. (S22; ST, 15-19, 15-20)

320-S. Application Guides in Specifying Steels. Joseph Gurski. *Steel Processing and Conversion*, v. 43, Apr. 1957, p. 210-213.

Practices in specifying steels in the range of permissible steel substitution determined at Ford Motor Co. by mechanical properties and manufacturing requirements. (S22; ST)

321-S. Specifications and Steelmaking Problems. D. H. Ruhnke. *Steel Processing and Conversion*, v. 43, Apr. 1957, p. 213-214, 231.

Problems for producer in delivering steels as specified by consumers. The trend toward ordering to hardenability limits, with some relaxation in analysis, has given considerable relief. (S22, J5; ST)

322-S. (German.) **Ultrasonic Testing of Sheets.** Hermann-Josef Kopineck and Hubert Hoff. *Stahl und Eisen*, v. 77, May 30, 1957, p. 727-734.

Use of ultrasonic testing methods in the strip rolling mill; application of the ultrasonic echo, ultrasonic penetration and plate-wave methods according to the type of plant; ultrasonic plate-wave testing of sheets; basic principles of the testing method; requirements to be met by testing plants; details of a testing plant. (S13g; ST, 4-3)

323-S. Blast Furnace Automatic Charging Control Integrated. *Blast Furnace and Steel Plant*, v. 45, May 1957, p. 498-500.

Brief description of new panel board control system which automatically controls processes from the time iron ore, limestone and coke are taken from their bins until material is dumped into the blast furnace. (D1a, 18-24, 1-2)

324-S. Use of Gamma Rays for Continuous Inspection. A. Kohn. *Iron and Coal Trades Review*, v. 174, May 10, 1957, p. 1083-1086.

Detection of cavities in semifinished products at rolling temperatures. (To be continued.) (S13e, 9-21)

325-S. Chlorine Method for the Determination of Non-Metallic Inclusions in Steel. C. W. Short, R. S. Roberts and G. Croall. *Iron and Steel Institute, Journal*, v. 186, May 1957, p. 85-89.

Describes new apparatus for chlorinating steel and two separate methods of analysis. 2 ref. (S11f, 1-3; ST, 9-19)

326-S. Hydrogen in Steelmaking Practice. Henry Epstein, John Chipman and Nicholas J. Grant. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, Apr. 1957, p. 597-608.

Determined hydrogen content for specimens from 3 acid openhearth, 2 basic openhearth and 7 basic electric furnace heats through refining period at tap and during pouring. Description of sampling technique and analytical apparatus. 21 ref. (S11r, D2, D5; ST, *H*)

327-S. Absolute Areas of Some Metallic Surfaces. Thomas L. O'Connor and Herbert H. Uhlig. *Journal of Physical Chemistry*, v. 61, Apr. 1957, p. 402-405.

Using the BET (gas adsorption) method, with ethane as adsorbate

at −183°, roughness factors were calculated for various metal surfaces. (S15)

328-S. Immersed Ultrasonic Inspection of Pipe and Tubing. R. B. Oliver, R. W. McClung and J. K. White. *Nondestructive Testing,* v. 15, May-June 1957, p. 140-144.

Inspection of pipe and tubing used in nuclear reactors. Instrument used is adaptable to small tubing down to 3/16-in. O.D. as well as to 8 in. diameter pipe, and lends itself well to continuous inspection at high rates of travel. (S13g, 1-2)

329-S. Use of Multiple-Film Technics to Speed Industrial Radiographic Inspection. Ralph E. Turner. *Nondestructive Testing,* v. 15, May-June 1957, p. 146-150.

Single-exposure technique using two or more films of different radiographic speeds—the slower to record thin sections, the faster to record thick sections—provides shortcut to examination of certain multithickness specimens. Range of thickness recorded on film is limited by the various radiographic speeds of film used at exposure value selected. (S13e, 1-2)

330-S. Ultrasonic Transmission Tester. J. D. Ross and R. W. Leep. *Nondestructive Testing,* v. 15, May-June 1957, p. 152-154.

An ultrasonic pulse is transmitted through object under inspection and the received pulse is checked for abnormal attenuation. Abnormally attenuated impulses are counted as the object is scanned, the total count being a measure of area over which internal defect extends. Description of equipment. (S13g)

331-S. Ultrasonic Inspection in the Oil Refining and Related Industries. Dwight J. Evans. *Nondestructive Testing,* v. 15, May-June 1957, p. 156-160.

Various types of ultrasonic testing equipment for oil industry application described. In widespread application is the measurement of thickness of steel plates when there is access to only one side, such as sides of filled storage tank, O.D. of an operating pipeline, hull plates of a tanker. More recent applications include internal-flaw and fatigue-crack detection in drive shafts or engine parts, and testing of welded seams, either as primary inspection method or as a supplement to X-ray or radiography techniques. (S13g, S14g)

332-S. Use and Limitations of Flexible Fluorescent Intensifying Screens in Ship Radiography. K. G. Roberts. *Nondestructive Testing,* v. 15, May-June 1957, p. 162-165.

Fluorescent intensifying screens have been found useful for steel thicknesses up to approximately 2½ in. when using 260-kvp. portable X-ray equipment in the field with relatively short exposure times (4 min. at 30-in. SFD). This technique permits use of tube kilovoltage-thickness graphs, and radiographic sensitivity has been found to be slightly over 1.5% for steel thicknesses from 1½ to 2½ in. Sensitivity values can be improved to better than 1.5% by replacing front fluorescent screen with a 0.0005-in. lead screen, but upper limit of steel thickness is reduced to 2¼ in. For high quality radiography with cobalt-60, fluorescent intensifying screens offer no advantages. For best sensitivity in short exposure times, a no-screen film with lead intensifying screens has proved most satisfactory. 5 ref. (S13e, X8h; ST)

333-S. Testing and Examination of Electrodeposits. Pt. 2. Measurements of Local and Average Thickness. R. Quarendon. *Product Finishing,* v. 10, Apr. 1957, p. 65-73.

Instruments and techniques used for measuring thickness of local and average electrodeposited coatings. Includes electromagnetic, reluctometer, nonmagnetic and radiation methods. 14 ref. (S14, 1-2, L17c)

334-S. Some Reflections on the Use of Radioisotopes in Industrial Radiography, With Specific Emphasis on the Use of Iridium (192) for the Radiographic Inspection of Structural Welding in Shipbuilding. Walter H. Sansom. *Shipbuilder and Marine Engine-Builder,* v. 64, May 1957, p. 329-333.

A discussion of radioactive isotopes available and the techniques of radiographic inspection. (S13e; 14-13)

335-S. Industrial Radiography by Gamma-Ray Projection From Radioactive Isotopes. Charles M. Dick. *Welding Journal,* v. 36, May 1957, p. 457-462.

Theory of flaw detection by radiography; characteristics of commonly used radioactive isotopes comparing energy levels and penetrating power; types of projectors and shields for control of radiation pattern of radioactive source; portability and other advantages of radioisotopes for inspection of welds. (S13e; 14-13)

336-S. Determination of Rare Earths in Thorium. E. J. Center, W. M. Henry and R. D. Householder. *U.S. Atomic Energy Commission,* BMI-260, May 15, 1957, 13 p. (CMA)

A quantitative method for separating and determining individual lanthanons in thorium down to 0.05 ppm. A cellulose column is used in the chromatographic separation, and a solution-type spectrographic procedure follows. Values given for recovery of europium, cerium, praseodymium, samarium and thulium tracers. (S11; Th, EG-g)

337-S. Chemical Analysis of Zirconium and Zircaloy Metals. E. B. Read and H. M. Read. *U.S. Atomic Energy Commission,* NMI-1171, Jan. 31, 1957, 108 p. (CMA)

Procedures for chemical analysis of other elements in zirconium and Zircaloy alloys, including aluminum, cadmium, chromium, copper, iron, lead, magnesium, manganese, molybdenum, nickel, tin, titanium, tungsten, vanadium, zinc, boron, carbon, chlorine, phosphorus, silicon, nitrogen, oxygen, hydrogen and the lanthanons. 78 ref. (S11; Zr)

338-S. Improved Technique for Determining the Softening Temperatures of Ores and Sinters. A. G. Astakhov. *Zavodskaya Laboratoriya,* v. 22, no. 5, 1956, p. 571-572. Henry Brutcher Translation, no. 3903.

Drawbacks of penetrating-rod methods currently in use; application of an electrical (bridge) system. (S16s; RM-n)

339-S. (English.) **Mass Spectrometric Study of Gallium and Indium.** Jean Drowart and Richard E. Honig. *Societes Chimiques Belges, Bulletin,* v. 66, May-June 1957, p. 411-412.

Gallium and indium were evaporated from beryllium oxide and graphite crucibles into the ion source of a modified 60° mass spectrometer at sample temperatures ranging from 1035 to 1320° K. for gallium, and from 800 to 1130° K. for indium. Small Ga_2^+ and Ga_2O^+, and In_2^+ and In_2O^+ peaks were observed. During the course of the evaporations, the peak ratios Ga_2^+/Ga_2O^+ and In_2^+/In_2O^+ stayed essentially constant, but the absolute peak intensities decreased to very small values. (S11c; Ga, In)

340-S. (French.) **Application of Radioactive Elements to Research on the Refining of High-Purity Aluminum and Iron.** Philippe Albert. *Annales de Chimie,* v. 1, Nov-Dec. 1956, p. 827-896.

Principles of systematic analysis of a group of elementary particles following irradiation. Analysis of iron and aluminum after atomic pile radiation; study of recrystallization of aluminum after cold working; study of elimination of and proportion of last traces of carbon in pure iron. 26 ref. (S11q, N5, 2-17; Al-a, Fe-a)

341-S. (German.) **Use of Radioactive Isotopes in the Metal Industry.** Kurt Sauerwein. *Atom Wirtschaft,* No. 1, Jan. 1956, p. 13-15.

Irradiation and tracer methods for thickness measurements and finished product control, testing of materials, radioactive level measurement, marking of substances, measurement of wear and mixing processes. (S14e, S18, Q9, 1-4; 14-13)

342-S. (German.) **Flue Gas Condensation Point and Corrosion.** W. Gumz. *BWK. Brennstoff, Wärme, Kraft,* v. 9, Mar. 1957, p. 118-125.

Formation of flue gas depends on the type of firing, temperature, excess of air and presence of suspended substances (dust, aeorosol). Measurement of the conductivity of the condensation layer or the cloudiness of a mirror were used to obtain flue gas condensation points. Suppression of sulphur trioxide formation and lowering of condensation level may be obtained through sudden cooling of gases, addition of absorbing solid materials or chemical absorption of the sulphuric acid. 50 ref. (S18, R7k; RM-g)

343-S. (German.) **Aluminum Casting Alloys. Tentative Standards to DIN 1725.** Ernst Brunhuber. *Giesserei-Praxis,* v. 75, May 10, 1957, p. 202-204.

Tabulation and discussion of German standards for nonferrous metals with changes to be incorporated. (S22, 15-6; Al, 5)

344-S. (Japanese.) **Colorimetric Determination of Tin in Nonferrous Metals by the Use of Oxidized Hematoxylin. Pt. I. Colorimetric Determination of Tin in Metallic Zinc. Pt. II. Colorimetric Determination of Tin in Metallic Lead.** Masuo Kojima. *Japan Analyst,* v. 6, no. 3, 1957, p. 139-146.

Various conditions for determination and the effect of interfering ions have been investigated. As a method of concentration of tin by the manganese dioxide method, the coefficient of coprecipitation of tin was determined with the use of radioactive isotope Sn^{113}; and this was applied to the quantitative analysis of tin in metallic zinc. The concentration of tin in metallic lead can be made similarly by the manganese dioxide coprecipitation method. (S11a; *Sn*)

345-S. (Japanese.) **Microdetermination of Carbon in Nonmetallic Compounds**

of Iron and Steel. Hitoshi Kamada, Shozo Toda and Takao Nishiya. *Japan Analyst,* v. 6, no. 3, 1957, p. 146-150.

An attempt was made to collect carbon dioxide produced from combustion by cooling with liquid oxygen, a part of which is taken in a gas meter and its quantitative determination carried out by mass analysis, using argon as an internal standard. Errors were 2-3% in samples containing 0.1 mg carbon. (S11r; Fe, ST, *C*)

346-S. (Japanese.) **Photometric Determination of Nitrogen in Steel.** Hitoshi Kamada and Ken Sato. *Japan Analyst,* v. 6, no. 3, 1957, p. 150-154.

An attempt to use pyridine-pyrazolone reagent as a coloring agent for cyanide for the investigation of a new quantitative colorimetric method, and the data collected are compared with those obtained by a micro-Kjeldahl method of steam distillation. (S11a; ST, *N*)

347-S. (Japanese.) **Analytical Studies on Microgram Quantities of Antimony. Pt. I. Decomposition and Concentration of Antimony in Lead.** Niro Matsuura and Masuo Kojima. *Japan Analyst,* v. 6, no. 3, 1957, p. 155-160.

Colorimetric determination of antimony in lead of high purity of so-called "five-nine" grade by the use of Sb^{124} was investigated. 18 ref. (S11a; Pb, *Sb*)

348-S. (Japanese.) **Analytical Studies on Microgram Quantities of Antimony. Pt. II. Ion Exchange Separation of Antimony in Highly Pure Lead Metals.** Yukichi Yoshino and Masuo Kojima. *Japan Analyst,* v. 6, no. 3, 1957, p. 160-164.

Radiochemical studies using Sb^{124} as a tracer proved that the antimony species obtained by dissolving the sample in dilute nitric acid can be converted into adsorbable form by heating with strong hydrochloric acid. It was also demonstrated that Sn (IV) can be separated by elution with 1N HNO_3 prior to that of Sb (V) with 1N NaOH. Methods of anion exchange separation of antimony in pure lead by both column and bath operation are proposed and some preliminary data are presented. 7 ref. (S11f; Pb, *Sb*)

349-S. (Russian.) **Spectrophotometric Determination of Tantalum in Titanium Alloys in the Ultraviolet.** B. M. Dobkina and E. I. Petrova. *Zavodskaya Laboratoriya,* v. 23, 1957, p. 421-422. (CMA)

The presence of titanium interferes with the determination of tantalum as a pyrogallol complex. The effect of the presence of titanium can be considerably reduced by using hydrochloric acid as the reaction medium and by observing in the ultraviolet part of the spectrum. These results were confirmed and it was established that reproducible results are obtained only when the reagents are introduced in a definite order. 8 ref. (S11a; Ti, *Ta*)

350-S. (Book.) **Compilation of Steel Piping Materials.** 455 p. June 1957. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $4.50.

Contains 60 specifications, one method of test and one classification. Of these, 27 are new or substantially revised since the previous edition of September 1955. Among topics covered are pipes; boiler, superheater, and miscellaneous tubes; steel tubes; heat exchanger and condenser tubes. Included are specifications for the following materials used in pipe and related installations; castings, forgings, bolts and nuts. (S22; ST, 4-10, 15-18)

Metal Products and Parts

169-T. Development and Uses of Spheroidal Graphite (Nodular) Cast Iron for Marine Applications, With Special Reference to Diesel Engines. A. G. Arnold and B. Todd. *British Cast Iron Research Assoc. Journal of Research and Development,* v. 6, Apr. 1957, p. 588-599.

Optimum properties of piston materials are given and, on this basis, high-duty cast iron, nodular cast iron and 13% chromium steel are compared. Analysis of service performance, causes of failures and further applications. (T22h, 17-7; CI-r)

170-T. Castings in Electrical Switchgear. C. A. Hillyer. *British Cast Iron Research Assoc. Journal of Research and Development,* v. 6, Apr. 1957, p. 600-607.

Typical examples of use of castings in switchgear described and illustrated. Electrical properties of the material are considered in relation to the special needs of the electrical engineer. (T1d, 17-7; CI)

171-T. Large Iron Castings in One Branch of the Chemical Industry. G. A. J. Begg. *British Cast Iron Research Assoc. Journal of Research and Development,* v. 6, Apr. 1957, p. 608-628.

Principal requirements and defects of chemical castings. Effects of carbon, nickel, sulphur and phosphorus on the soundness, corrosion resistance and general performance of chemical plant castings. (T29, 17-7, 1-10; CI)

172-T. Welded Aluminum-Alloy Deckhouses. W. Muckle. *British Welding Journal,* v. 4, Apr. 1957, p. 161-167.

Design of deckhouse and relation to structure of ship; special problem of joining aluminum house to steel ship. Mode of construction of welded aluminum structures. 5 ref. (T22j, K general; Al, ST)

173-T. Characteristics and Application of Round, Flattened, and Locked Strand Ropes. H. Hitchen. *Canadian Mining and Metallurgical Bulletin,* v. 50, May 1957, p. 281-288.

Different types of wire ropes for various engineering and mining duties are considered with reference to tensile strength, corrosion, elasticity, safety factors and nondestructive tests. (T7g, 17-7)

174-T. Application of Sintered Oxide Cutting Tools. Louis M. DeMarco. *Iron and Steel Engineer,* v. 34, Apr. 1957, p. 87-90.

High alumina sintered oxide material for cutting tools. Best results were obtained with negative rakes and large lead angles. Also promising for use in wear applications. (T6n, 17-7; SGA-j, 6-20)

175-T. New Fasteners Beat the Heat. *Machine Design,* v. 29, May 16, 1957, p. 24-28.

A new family of fasteners for aircraft structures combines a striking 220,000-psi. tensile strength at room temperature with a startling 170,000 psi. at 900° F. (T7f, 17-7, Q27a, 2-12)

176-T. Pipeline Steels. A. B. Wilder and A. F. Aebersold. *Mechanical Engineering,* v. 79, May 1957, p. 448-453.

Review of the development of the industry with an analysis of current and future trends. (T26r, 17-7; ST)

177-T. (English.) **Steel Silo of the Pithiviers District Grain Growers' Cooperative (France).** *Acier-Stahl-Steel,* Feb. 1957, p. 55-57.

Installation built in the form of 18 steel cells of 160 tons each, using sheet steel stiffened by means of pressed ribs. (T3b, 17-7; ST)

178-T. (French.) **Zip Slide.** *Cuivre Laitons Alliages,* no. 36, Mar-Apr. 1957, p. 19-23.

Use of 65-35 U-Z 36 brass for the links and annealed U-Z 33 brass for the slides of zip fasteners. Methods of manufacture, classification of zippers and the high resistivity of brass and its excellent appearance after chemical treatment. Nickel silver is also widely used. (T10k, 17-7; Cu)

179-T. (French.) **Choice of Gear Steels and Their Heat Treatment. Pt. II.** O. Patterman. *Metallurgie et la Construction Mécanique,* v. 89, May 1957, p. 437-449.

Tables listing steels used in the United States and Europe for motor car gears; distribution of fibers in the manufacture of roughed-out toothed wheels; influence of the surface finish of gears; factors influencing choice of steel; influence of heating time and tempering temperature. (T7a, 17-7, J general; ST)

180-T. Aluminum in Freight Cars. C. O. Curell. *American Society of Mechanical Engineers,* Paper No. 57-RR-9, Apr. 1957, 12 p.

Improved aluminum alloys, fabrication methods and joining techniques now available for construction of railroad freight cars and components. (T23p, 17-7; Al)

181-T. Metallic Material Engineering and Manufacturing Aspects of New High-Speed Aircraft. E. A. Simkovich. *American Society of Mechanical Engineers,* Paper No. 57-SA-40, June 1957, 6 p. $.50.

The "bit-and-piece" method of manufacturing and assembling aircraft structure is described. The use of large integral subassemblies and structures such as castings, forgings, and honeycomb joined together by flash welding or a minimum of fasteners appears to be applicable in the great majority of cases. (T24, K general)

182-T. Materials Aspect of Some High-Temperature, Refinery-Piping Applications. E. A. Sticha. *American Society of Mechanical Engineers Transactions,* v. 79, p. 715-719.

Materials most commonly used in these applications and some problems encountered in the past ten years. (T29n, 17-7; ST, 4-10)

183-T. Material Requirements of the Australian Aircraft Industry. H. E. Arblaster. *Australasian Engineer,* no. 46, Mar. 7, 1957, p. 47-55.

Comparison of British and American aircraft steels, stainless steels and magnesium alloys. (T24, 17-7; ST, SS, Mg)

184-T. New Big-Inch Pipe Mill Is Industry's Showpiece. Eric Crawford. *Canadian Machinery,* v. 68, May 1957, p. 101-109.

Description of the new Welland plant in Ontario. Steel pipe up to 36 in. in diam. is produced and capacity is about 350,000 tons per year. (T26r, 1-2)

185-T. Molybdenum Electrodes for the Glass Industry. R. R. Freeman. *Central Glass and Ceramic Research Institute Bulletin,* v. 3, Oct-Dec. 1956, p. 187-191. (CMA)

Pure molybdenum ingots are prepared by powder metallurgical methods and "furnace sintering" at 3000° F. The electrodes are pressed with hydrostatic pressure in rubber bags or molds. The properties of molybdenum which make it suitable for use as an electrode in a glass furnace are high melting point, high-temperature strength, thermal and electrical conductivity, low coefficient of expansion, resistance to glass corrosion, and the formation of colorless oxides. The electrode must be kept immersed in molten glass to prevent oxidation; the starting-up period is the most critical. Blows and shocks to unavoidably recrystallized molybdenum should be prevented. Machining, forming and joining recommendations are given. Molybdenum powder is available at reasonable cost.
(T29a, 17-7, H general; Mo)

186-T. Vikon Enameled Metal Tile. James Staples. *Compressed Air Magazine,* v. 62, May 1957, p. 130-132.

Porcelain and synthetic resin coatings bonded to light base produce durable and attractive building material. (T26n, 17-7, L27)

187-T. Use of Aluminum Alloys for Ships' Superstructures. *Corrosion Prevention and Control,* v. 4, Apr. 1957, p. 40.

Ship in service since 1954 has unpainted welded aluminum-magnesium alloy superstructure and is in excellent condition in spite of exposure. (T22j, 17-7; Al)

188-T. Corrosion Resistant Steel Tubes. T. Gibbs. *Corrosion Prevention and Control,* v. 4, Apr. 1957, p. 41-42.

Note on wide and varied application of stainless steel tubing ranging from hypodermic needles, tubes for food handling, tubes for chemical industries, aircraft structural materials and bus seat rails.
(T general, 17-7; SS, 4-10)

189-T. Don't Pass up Low-Nickel Stainless. Harold Rapp. *Food Engineering,* v. 29, May 1957, p. 98-103.

The lustrous, economical Type 200's, developed to conserve scarce nickel, rate as good as the celebrated 18-8. Thus they can handle many of the toughest jobs in the food field. Type 400's also have numerous pertinent applications. (T29p, 17-7; SS)

190-T. (German.) **Experiments With Aluminum Rivets of 24-Mm. Shaft Diameter.** P. Steeg. *Aluminium,* v. 33, June 1957, p. 385-386.

The new type of rivet, developed by Krupp's at Rheinhausen, can still be driven, both in workshops and in large-scale assembly works, with the normal tools, even in shaft diameters of 20 mm. (0.8 in.) and over. Manufacture of these rivets and results of shearing and tensile tests. The rivets satisfy all the prescribed mechanical property specifications and have certain technical and economic advantages over steel rivets of the same diameter.
(T7f, 17-7; Al)

191-T. Pearlitic Malleable Iron Crankshafts. Developments for the Pontiac V-8 Engine. *Automobile Engineer,* v. 47, May 1957, p. 179-181.

Mechanical properties, wear characteristics, heat treating and machinability are considered. 3 ref. (T21c, 17-7, Q general, J general, G17k; CI-s)

192-T. Ceramic Materials for Cutting Tools. *Mass Production,* v. 33, May 1957, p. 127-129.

The main constituent of "Sintox" is aluminum oxide. The finished article is extremely hard and this hardness is not reduced by any but extremely high temperatures. This immediately makes it a subject for investigation as a high-speed cutting medium. Research in this direction is encouraged by the fact that the raw materials from which it is made are readily available and widespread about the earth's surface. (T6n; Al, 6-20)

193-T. Aircraft Materials—Present and Future. *Materials and Methods,* v. 45, May 1957, p. 126-130.

Air frame and power plant materials are discussed; notes aluminum, titanium, molybdenum, stainless steels, cermets and other materials and the oxidation, creep, fatigue resistance properties needed. (T24, 17-7)

194-T. How to Choose a Less Critical Material in Designing Military Equipment. Franklin P. Huddle. *Materials and Methods,* v. 45, June 1957, p. 107-109.

Basic principles to follow in judging relative availability of materials and description of alternative materials index of both metallic and nonmetallic materials set up to serve as guide for designing military equipment. (T2, 17-1, 17-7)

195-T. Bronze for Memorial Plaques. Robert J. Nekervis. *Materials and Methods,* v. 45, June 1957, p. 120-121.

Castings made of copper-tin alloys with small lead or zinc additions continue to provide corrosion resistance and suitable finish for use as memorial plaques.
(T9q, 17-7; Cu-s)

196-T. Economics of Aluminum in Electrical Engineering. E. G. West. *Metallurgia,* v. 55, June 1957, p. 265-270.

Economic background of case for aluminum as preferred metal in field considered. Three main sections deal with metal supplies (Al, Cu, Pb, Zn); present economics and future trends. (T1, 17-7, A4; Al)

197-T. Magnesium in Military Electronics. A. F. Maynard. *Modern Metals,* v. 13, May 1957, p. 66-68, 70.

Cites numerous examples of the use of magnesium housings and covers and structural materials in military electronics, especially in the airborne electronics field.
(T2, Ti; 17-7; Mg)

198-T. Coil Meets Foil. T. E. Lewis and J. C. Meekins. *Modern Metals,* v. 13, May 1957, p. 74-82.

Use of electromagnetic coils using aluminum foil to replace copper wire as electrical conductor offers savings on material cost and possibility of easier fabrication. (T1m, 17-7; Al)

199-T. Developing Zirconium Cans for SRE Moderator Graphite. J. A. Leppard. *Nucleonics,* v. 15, June 1957, p. 84-85. (CMA)

A series of photographs are presented to show the form, installation, welding and assembly of zirconium cans for moderator graphite. The results of stress-to-rupture tests on hafnium-free zirconium at 1000° F. are shown. (T11m, 17-7, Q3m, Zr)

200-T. Performance Characteristics of Barium Getters With Particular Reference to Their Application in Thermionic Valves. P. della Porta. *Vacuum,* v. 4, July 1954, p. 284-302. 4, July 1954, p. 284-302.

From a practical point of view it is preferable to assess getter characteristics by their absorption capacity instead of by gettering rates as defined in the past. The merits of assessing getter performance in terms of "instantaneous absorption capacity" defined in cc.-microns per sec. are discussed. Results are given for the getter performance with respect to a number of gases obtained by employing the revised method. 25 ref. (T1, 17-7; Ba)

201-T. Magnesium-Thorium Alloys as Missile Materials. Donald Mathews. *Western Aviation,* v. 37, May 1957, p. 6-8.

Observations on mechanical properties; fabrication properties; and radioactivity and toxicity. (T24e, 17-7, Q general, G general, P18; Mg, Th)

202-T. Efficiencies of Materials in Aircraft Compression Panels. Edward Z. Gray. *Western Aviation,* v. 37, May 1957, p. 9.

Comparison of structural efficiencies of beryllium, titanium, and aluminum in skin-stringer sandwich panels. (T24a; 17-7; Be, Ti, Al)

203-T. Titanium Goes Commercial —Corrosion-Free Valves Have Long Life Expectancy. *Western Metals,* v. 15, June 1957, p. 62. (CMA)

Fabri-Valve Co. of America (Portland, Ore.) is prepared to mass produce titanium valves in any style and size after 2½ years of research. The first valves are 6-in. wedge gates about 24 in. high and weighing 60 lb. Finished costs of titanium parts are now at about 3:1 compared with stainless steel. A wide use of titanium valves is expected because of their longer service life. Only about 1% of titanium mill products, out of the 10% allotted, finds its way into civilian use.
(T7b, 17-7; Ti)

204-T. Evaluation of the Quality and Uniformity of the Titanium Mill Products Received by the Aircraft Industry During 1956. F. J. Gillig and L. W. Smith. Battelle Memorial Institute, Titanium Metallurgical Laboratory. *U.S. Office of Technical Services, Report 66,* PB 121625, Mar. 1957, 75 p. (CMA)

Quality and uniformity were surveyed for titanium sheet and forgings reaching the aircraft industry in 1956. Visits were made to four titanium producers, four jet engine firms, and 16 fabricators of airframe parts. Data also presented for material produced two years earlier. (T24, 17-7, S general; Ti)

205-T. (German.) **Composition, Properties and Strength Values of American Metallic Materials for Screws and Compression Springs.** Helmut Keitel. *Draht,* v. 8, May 1957, p. 180-186.

Covers carbon steel wire, alloy steel wire, high-alloy compression steel wire (high-temperature, nonrusting), copper alloys, nickel alloys; tensile strength; setting of springs at raised temperatures; fatigue strength of springs. 5 ref. (T7c, 17-7, Q27a, Q7a; CN, AY, Cu, Ni)

206-T. (Italian.) **New 20-Lira Aluminum-Bronze Coins in Italian Monetary System.** *Alluminio,* v. 26, May 1957, p. 225-227.

A 250-million piece minting put into circulation Apr. 15, 1957. Requirements, composition, characteristics of alloys for coins; advantages of "Bronzital", titanium-aluminum-bronze alloy particularly suitable for monetary applications.
(T9a, 17-7; Cu, *Al*)

207-T. (Japanese.) **Study on Zirconium Alloys.** Y. Mishima and S. Morikawa. *Light Metals (Tokyo)*, no. 23, Mar. 1957, p. 61-76. (CMA)

Work-hardening of pure zirconium and Zircaloy 6-2 and some effects of heat treatment were studied. Both optical and electron micrography of the metals are feasible. The work is preliminary to a study of the application of the metals in nuclear reactors.
(T11, 17-7, M21, 2-14; Zr)

208-T. (Portuguese.) **Cast Iron for Automobile Brake Drums.** Cyro Guimaraes. *ABM-Noticiario*, v. 11, June 1957, p. 2-4.

Production of iron of necessary mechanical properties per SAE and ASTM specifications is still a problem in Brazil. Metallurgy of pearlitic malleable cast iron is discussed and results are given of experimental runs made at Institute for Technological Research, Sao Paulo, using Detroit-type arc furnaces. 5 ref.
(T21c, 17-7; E11; CI-s)

209-T. (Swedish.) **Aluminum Siding on Houses.** Carl-Erik Lindgren. *Teknisk Tidskrift*, v. 87, Jan. 22, 1957, p. 67-71.

Surface treatment of external walls. Aluminum sheets (0.25 mm.) are used as covering and as a base for resistant, baked paint.
(T26n, 17-7; Al)

W Plant Equipment

217-W. In-Wall Temperature During Blow-In. A. T. Sadler. *Blast Furnace and Steel Plant*, v. 45, Apr. 1957, p. 48-52.

Rate of temperature rise of new linings in blast furnaces followed by means of thermocouples placed in wall during relining. Data on furnace dimensions and wind rate.
(W17g, X9q, 1-2; RM-h)

218-W. Venturi Washers. L. W. Butz. *Blast Furnace and Steel Plant*, v. 45, Apr. 1957, p. 398-399.

Operational advantages from installation of Venturi gas washers in blast furnace at Bethlehem Steel plant. (W17n, 1-2)

219-W. Metal Vacuum Furnace for the Melting of Metals by Radio Frequency Heating. F. Roberts and B. T. Bell. *Combustion Boiler House and Nuclear Review*, v. 11, Apr. 1957, p. 169-172.

Water-cooled metal vacuum furnace for the vacuum melting of metals such as copper, steel and uranium using a high voltage valve oscillator as the power supply; furnace design and operation.
(W18a, 1-2, 1-23)

220-W. Electric Salt-Bath Furnaces. Greater Efficiency Than Conventional Furnaces. *Corrosion Technology*, v. 4, Apr. 1957, p. 118-119.

Use and development of electric salt bath furnaces, their construction and applications.
(W27m, 1-2, 1-18)

221-W. Melting Facilities Get Priority. *Foundry Trade Journal*, v. 102, Apr. 11, 1957, p. 439-446.

Describes cupola charging conveyor system with weighing buckets and induction melting furnace of 5-ton capacity, 50-cycle type. Installations at International Combustion Ltd. (W18d, W18a, W12b, 1-2)

222-W. Nuclear Technology and the Steel Industry. R. P. Petersen. *Iron and Steel Engineer*, v. 34, Apr. 1957, p. 124-128.

Brief review of significance of atomic energy. Estimate of atomic power costs; assuming successful technology, nuclear power ought to be 10¢ per million Btu.
(W11p, 1-2; ST)

223-W. Metallurgical Problems of Atomic Energy. L. Rotherham. *Journal of the Institute of Metals*, v. 85, May 1957, p. 393-396.

Problems arising in connection with structures, fuels and special metal requirements. Reference to analogous problems in other industries. (W11p, 17-7)

224-W. Extrusion Press Tooling. Pt. 1. Frank Sowa. *Light Metal Age*, v. 15, Apr. 1957, p. 37-39.

Discusses billet container of extrusion press, materials for construction and types with 1, 2 or 3-piece construction. (To be continued.) (W24g, F24, 1-2, 17-7)

225-W. Development of Rolling Mill Design for Aluminium. *Light Metals*, v. 20, Apr. 1957, p. 118-119.

Developments during past 27 years in design of rolling mills for light metals by W. H. A. Robertson and Co. (W23, 1-2, 17-1; Al)

226-W. Automated Line at Pontiac for Stem Pinion Machining. Herbert Chase. *Machine and Tool Blue Book*, v. 52, Apr. 1957, p. 116-120.

Milling centering machines and five lathes with loading and transfer equipment perform all turning, facing and chamfering operations automatically on stem pinion of SAE 4620 steel.
(W25n, W25r, 1-2, 18-24; AY)

227-W. Developments at the Works of Beans Industries. *Machinery*, v. 90, Apr. 26, 1957, p. 919-922.

Conveyor system mechanizes handling in core and molding sections of foundry. (W12r, 1-2, E general)

228-W. Almco Supersheen Barrel-Finishing Process. *Machinery*, v. 90, Apr. 26, 1957, p. 923-926.

Barrel finishing machines and their use for cleaning and polishing stainless, aluminum and other metal parts; loading arrangements and fixtures for holding components during barreling; submerged barrel finishing machines.
(W2s, 1-2; SS, Al)

229-W. Automatic Material-Handling for the Die-Caster. E. N. Field. *Machinery*, v. 63, May 1957, p. 179-185.

Systems and devices for the automatic removal and transfer of castings from casting, forming or trimming dies. (W12, 1-2, E13)

230-W. New Flame-Cutting Machines in Shipbuilding. Richard Bechtle. *Welding and Metal Fabrication*, v. 25, Apr. 1957, p. 125-130.

Design of metal-cutting machines used in European shipyards with note on template for adjusting cutting jets and types of guide rails; arrangements for continuous cutting and control of machines.
(W29d, G22g, 1-2)

231-W. How to Select Proper Regulators. Pt. 2. A. F. Chouinard. *Welding Engineer*, v. 42, May 1957, p. 34-36.

Operating characteristics of gas cylinder pressure regulators, advantages of pressure compensating nozzle-type regulator for most types of gas used in welding, except carbon dioxide. (W29c, W29e, 1-2)

232-W. Filler Metals for Joining. Orville T. Barnett. *Welding Engineer*, v. 42, May 1957, p. 64-70.

Considers the nature of cast iron and problems arising in joining it by brazing or welding; filler rods for electrodes with cast iron bases, copper bases, nickel bases and steel filler metals; typical analysis, welding procedure used, special advantages and applications.
(W29h, 1-2; CI, Cu, Ni, ST)

233-W. New Concept for Control of Resistance-Welding Machines. W. J. Farrell and J. L. Solomon. *Welding Journal*, v. 36, Apr. 1957, p. 356-362.

New concept of direct counting of cycles of line frequency, and impulses of secondary current, rather than previous indirect method of timing, provides control medium of absolute accuracy permitting unlimited function duration.
(W29c, K3, 1-2)

234-W. Fabricating the Vallecitos Atomic Reactor. J. D. Harrell. *Western Machinery and Steel World*, v. 48, Apr. 1957, p. 106-110.

Welding and inspection techniques used in fabrication of vessel 7 ft. in diam. and 22 ft. high from 3⅝-in. stainless clad mild steel.
(W11p, 17-7, K general, S general; CN, SS, 8-16)

235-W. On the Use of Dolomite Brick in Openhearth and Electric Arc Furnaces. F. Gareis. *Henry Brutcher Translation* No. 3354, 3 p. (From *Stahl und Eisen*, v. 72, no. 7, 1952, p. 345-347.) Henry Brutcher, Altadena, Calif.

Difficulties encountered when first using dolomite brick in openhearth furnace because of contraction and infiltration; results of trials made to study performance of improved dolomite brick in bulkheads, piers, roofs and flues of openhearth furnaces; behavior of improved dolomite brick in walls, bottoms, arches and piers of arc furnaces.
(W18r, W18s, 17-7, RM-h)

236-W. Ways of Extending the Life of Blast Furnaces. S. I. Shkumatov. *Henry Brutcher Translation* No. 3868, 4 p. (From *Stal'*, v. 16, no. 3, 1956, p. 200-203.) Henry Brutcher, Altadena, Calif.

Various refractory materials used in blast-furnace hearth bottom, hearth walls, bosh zone and shaft, and performance in the course of 12 years of operation; advantages of use of larger quantities of basic refractories and carbon blocks in furnaces operating on a basic slag. Lining materials, thicknesses, recommended for a blast furnace.
(W17g, 1-2; ST, RM-h)

237-W. Ramming of Runners From Blast Furnace With a Carbonaceous Composition. M. K. Vasil'ev. *Henry Brutcher Translation* No. 3901, 1 p. (From *Metallurg*, v. 1, no. 1, 1956, p. 20.) Henry Brutcher, Altadena, Calif.

Lining of iron and slag runners from blast furnaces with a carbon material (instead of foundry sand, etc.). Particulars on composition and preparation of the carbonaceous ramming mass; performance of the carbon linings in actual service.
(W17g, 1-2, RM-h)

238-W. (French.) **Small Capacity Furnaces for Heat Treatments.** J. G. Robin. *Metallurgie et la Construction Mecanique,* v. 89, May 1957, p. 467-471.

Multiplicity of treatments necessitated by engineering requirements; characteristics of furnaces built for this treatment; vertical furnaces; horizontal furnaces; quenching vats; oil refrigeration; temperature. (W27, 1-2)

239-W. (French and German.) **Rational Handling of Heavy Nonferrous Metal Scrap.** W. Affolter. *Pro-Metal,* v. 10, Apr. 1957, p. 799-805.

Methods and equipment newly introduced in metallurgical plants with special reference to the use of pallet boxes as containers for the easy transport and storage of all types of scrap. (W12c, 1-2; EG-a, RM-p)

240-W. (German.) **Green Sand Molds for Large Steel Castings.** Charles W. Briggs. *Giesserei,* v. 44, Apr. 25, 1957, p. 238-245.

Characteristics of new facing sand; reconditioned, reclaimed sand as facing sand; handling and storing of sand; the molding process; skin drying and mold washes; cores for large green sand molds; advantages and difficulties of green sand molding of large steel castings. (W19g, 1-2; NM-f45, ST)

241-W. (German.) **Economic Transport in the Foundry by Means of Lifting and Stacking Trucks.** Fr. Fink. *Giesserei,* v. 44, Apr. 25, 1957, p. 263-266.

Examples of rationalization of transportation in charging furnaces: preparation of sand, stocking in the melting shop, conveying pattern and mold boxes, and transport of finished castings. (W12, 1-2, E general)

242-W. (German.) **Novel Core Molding Machine.** Erwinn Knipp. *Giesserei,* v. 44, Apr. 25, 1957, p. 267-268.

Manufacture of cores from sand, oil sand and cement sand; description of core molding machine. (W19g, 1-2; NM-f45)

243-W. (German.) **Transport and Handling of the Materials Charged Into the Blast Furnaces in the United Kingdom.** Howard R. Mills and John H. Turnbull. *Stahl und Eisen,* v. 77, Apr. 18, 1957, p. 457-469.

Influence of the difference in supply of domestic and imported ores on the transportation and handling problems. Transport and handling of coal and coke; coal handling and treating within the works, transport and blending of the coal and feeding into the coke-ovens. (W12, 1-2, D1; RM-j, RM-n, Fe)

244-W. (German.) **Fundamental Trend of Development in the Construction of Cars for German Iron and Steel Works.** Friedrich Brill. *Stahl und Eisen,* v. 77, Apr. 18, 1957, p. 469-476.

Significance of the transportation task within the sidings of iron and steel works. Box-type and self-discharging cars; door operating gear of the self-discharging cars. (W12n, 1-2; ST)

245-W. (German.) **Induction Melting Furnaces.** Aldo Cella and Karl-Heinz Brokmeier. *Zeitschrift für Metallkunde,* v. 48, Apr. 1957, p. 201-205.

The operating principles of seven important induction melting furnaces described to point out that the net frequency induction furnace with crucible is a most versatile and adjustable instrument under many working conditions. 8 ref. (W18a, 1-2)

246-W. Experience With a Coreless, Mains Frequency, Melting Furnace. T. R. Twigger. *British Foundryman,* v. 50, Jan. 1957, p. 32-38.

Description of coreless induction melting furnace for 60-cycle per sec. current with maximum charge of 1800 lb.; experiences with installation in a British iron foundry in melting cast irons. 6 ref. (W18a, 1-2; CI)

247-W. Cupola Developments. *British Foundryman,* v. 50, Mar. 1957, p. 110-127.

Types of hot blast plants operating in the United Kingdom with operating details for nine plants. Effect of hot blast temperature, composition and tapping temperature; coke performance with heated blast; effect of oxygen on melting rate, tapping temperature and composition of melt; economics of oxygen enrichment. 10 ref. (W18d, E10a, 1-2)

248-W. Experiences in Operating a Wet Spark Arrester on a Cupola. M. M. Hallett and T. Shaw. *British Foundryman,* v. 50, Mar. 1957, p. 128-131.

Spark arrester is mounted on a cupola of 36-in. melting zone diam. and consists of an expansion chamber containing a water-cooled central baffle. Operating procedure, cost data. (W18d, 1-2)

249-W. Dehumidification of the Cupola Blast. F. W. Jacobs. *Foundry,* v. 85, May 1957, p. 174-177.

An 80-ton dehumidifier at Texas Foundries, Inc. consisting of two compressor units cools air to 41° F. where it is capable of holding 3 grains of moisture per cu. ft. Savings in coke and other material result. (W13f, E10a, 1-2)

250-W. Radioactive Gage Aids Cupola Stock-Line Control. H. A. Tuttle, G. E. Noakes and T. Roy Thomas. *Foundry,* v. 85, May 1957, p. 178-179.

Gamma-ray source and Geiger tube detectors and counter used for plotting stock height in cupola and controlling charging bucket and hot blast. (W18d, S19, 1-2)

251-W. Rolling Mill Engineering Practice. Pt. 1. Roll-Neck Bearings. F. G. Thomson. *Iron and Coal Trades Review,* v. 174, Apr. 26, 1957, p. 985-988.

Evolution and development of roll-neck bearings. 3 ref. (W23m, 1-2)

252-W. Rolling Mill Engineering Practice. Pt. 2. Rolling Mill Tables. F. G. Thomson. *Iron and Coal Trades Review,* v. 174, May 3, 1957, p. 1041-1042.

Discussion on the design of tables with emphasis on bearings. (W23m, 1-2)

253-W. Tinplate Manufacture. John H. Mort. *Iron and Steel,* v. 30, Apr. 1957, p. 131-136.

Equipment used in cold reduction of steel sheet and in continuous electrotinning in plants in South Wales. Evaluates productivity and presents formula for assessing performance for these and other installations. (To be concluded.) (W23f, W3d, 1-2; ST, *Sn*)

254-W. Metallic Recuperators. W. Ernest and C. B. Tupholme. *Iron and Steel,* v. 30, Apr. 1957, p. 139-142.

Relative advantages and efficiency of high-temperature, metallic heat recovery and heat exchanger devices. Consideration of theoretical aspects and metallic heat exchanger design. Heat resistant steels, their resistance to cracking, scaling and problems in fabrication. (To be concluded.) (W13b, 17-7; ST, SGA-h)

255-W. Induction Melting. New Birlec Mains Frequency Furnace of International Combustion, Ltd. *Iron and Steel,* v. 30, Apr. 1957, p. 151-152.

Description of 300-kw., 5-ton capacity furnace operated on 50-cycle current and its use in production of spheroidal graphite cast iron. (W18a, 1-2, E10r; CI-r)

256-W. Evaluation of Cast Refractory Hot Top Linings. R. J. Tatousek and A. T. Peters. *Journal of Metals,* v. 9, Apr. 1957, p. 582-585.

Results of program at Inland Steel to evaluate performance of regular and reduced volume, cast refractory and brick-lined hot tops for ingot molds. Cast linings had longer life but were more costly and difficult to install. (W19c, 1-2; RM-h)

257-W. Production of the Renault Dauphine. *Machinery,* v. 90, Apr. 12, 1957, p. 792-812.

Description of automated section for machining cylinder block castings. Covers milling, holding and transfer equipment. (W25r, 1-2; ST)

258-W. Laminations Relieved by Continuous Process. *Metalworking Production,* v. 101, Apr. 12, 1957, p. 629-630.

Continuous electrical resistance furnace with protective nitrogen atmosphere for annealing cold rolled silicon steel transformer laminations. (W27j; 1-2, 1-11, J23; ST, *Si*)

259-W. Forming Intricate Passageways With Removable Sheathed-Tube Cores. Robert F. Dalton. *Modern Castings,* v. 31, May 1957, p. 91-93.

Soft copper tubes covered with woven fiber glass are used for coring passageways in aluminum alloy castings; woven stainless steel braiding used for covering copper tubes to core magnesium castings; copper tube cores removed by acid solution; limitations and costs of operations. (W19g, 1-2; Al)

260-W. Make Pickling Tank Linings Last Longer. Carl M. Jacobson. *Steel,* v. 140, p. 172-175, 179.

Preventive maintenance in pickling operations; selection of lining materials and equipment; hints for maximum service life. (W10a, L12g, 1-2)

261-W. Stainless Steel Filters. Jarda Polak. *Tech Engineering News,* v. 39, Apr. 1957, p. 46-47.

Stainless steel filters made by powder methods are finding large-scale application in industry. They exhibit high strength and good corrosion resistance at temperatures up to 500° C. They are easily made in a wide variety of shapes and sizes, and in as many degrees of porosity as ordinary metal screens. (W13, 17-7; H general; SS)

262-W. Vacuum Process: Precise Heat Treat, Brazing Method for Assemblies. John J. Lawless, Jr. *Western Metals,* v. 15, May 1957, p. 47-49.

Vacuum furnaces prove useful for precision brazing and heat treating operations on variety of materials including titanium, stainless steels and iron alloys with magnetic properties. (W29m, 1-3, 1-23; Ti, SS, Fe)

263-W. (Czech.) **Refractory Linings of Rotary Furnaces for Blooming Mills.** Eugen Viktora and Vaclav Zavesky. *Hutnické Listy,* v. 12, no. 5, May 1957, p. 417-423.

Chemical processes occurring in the contact area between melt and lining; durability of linings. (W18b, 1-2; RM-h)

264-W. (French.) **Rail Transport of Hot Ingots and Molten Metal.** *Usines d'Aujourd'hui,* no. 33, p. 28-32.

Technical problems involved in rail transport of a steel ingot weighing 52,000 kg. at 750° C., and of molten metal at about 1400° C. (W12p, 1-2; ST)

265-W. (French.) **New "Steckel" Hot Rolling Mill Train at the Forges d'Hennebont.** *Usines d'Aujourd'hui,* no. 33, p. 37-44.

Modernization of 100-year-old plant employing some 1700 workers. (W23, 1-2)

266-W. (French.) **New Aluminum Wire Rolling Mill at the Trefileres et Laminoirs at Harve.** Jean Herenguel. *Usines d'Aujourd'hui,* no. 34, p. 69-73.

New installation will produce 8000 tons per year of aluminum conductor wire and "Almelec" wire. Equipment, plant layout, photos. (W24k, 1-2; Al)

267-W. (German.) **Automatic Equipment of the Openhearth Furnace Operated by Unpurified Hot Generator Gases.** Harry Stollberg. *Neue Hutte,* v. 2, Apr. 1957, p. 220-226.

Structure of the openhearth furnace automation equipment employed; general principle of the gas-air proportional control and intake; gas-air ratio; roof temperature control; efficiency and applications; equipment used. 3 ref. (W18r, 1-2, 18-24)

268-W. (German.) **Behavior of the Surface of Rolls During the Rolling Process.** Wilhelm Hesse. *Stahl und Eisen,* v. 77, May 30, 1957, p. 715-727.

Theoretical principles for the formation of fractures and surface defects on the rolls; static and dynamic causes of the fractures; stresses caused by temperature variations, by the method of fabrication used and by mechanical strain during rolling; comparison of the theoretical considerations with examples of practical operation; examples of scaling and cracking of the surface with different methods of rolling and different qualities of rolls; effect of a surface treatment of the rolls on the formation of cracks. (W23k, 17-7; ST, 9-21, 9-22)

269-W. Factors Affecting Ingot-Mould "Life". *Foundry Trade Journal,* v. 102, May 16, 1957, p. 615.

Important factors for steel ingot molds are mold cleanliness, temperature and coating. (W19c, 1-2)

270-W. Vertical Heat Treating in Large Drop-Bottom Furnace Minimizes Distortion. *Industrial Heating,* v. 24, Apr. 1957, p. 836-843.

Vertical drop-bottom electrical resistance furnace with working diameter of 6 ft. and working height of 22 ft. capable of hardening, annealing, stress-relieving or normalizing steel or aluminum. (W27j, 1-2)

271-W. Iron Powder Electrodes Success or Failure. D. L. Mathias. *Industry and Welding,* v. 30, June 1957, p. 55-58, 85.

Performance characteristics of iron powder electrodes; improved arc action due to iron powder in coating; increased rates of depositions found only in electrodes with high percentage in covering. (W29h, 1-2)

272-W. Metallic Recuperators. Their Application to Industrial Furnaces. W. Ernest and C. B. Tupholme. *Iron and Steel,* v. 30, May 1957, p. 193-195.

Briefly describes important designs of metallic recuperators on the market and their range of application. Designs capable of being used on soaking pits and reheating furnaces with waste gas temperatures up to 1400° C. (W20g, W20h, 1-2)

273-W. Mill Requirements Point to Five-Zone Furnace. J. E. Hovis. *Iron and Steel Engineer,* v. 34, Apr. 1957, p. 98-104.

Review of heating requirements. Five-zone furnace is suggested as an improvement in continuous reheat furnace design, which can meet high mill demands within the minimum furnace length and yet achieve product flexibility. (W20h, 1-2)

274-W. Century of Cowper Stoves. Daniel Petit. *Iron and Steel Institute, Journal,* v. 185, Apr. 1957, p. 501-509.

Brief account of life and work of Edward Alfred Cowper, 1819-1893, inventor of hot blast stove for blast furnace. Survey of modern plant and practice with comparison between European and U.S. installation. Outlines possible future developments in blast stoves. (W17m, 1-2)

275-W. Planning the Conversion of a High-Life Slabbing Mill to a Universal Mill. C. E. H. Morris and R. N. Dale. *Iron and Steel Institute, Journal,* v. 185, Apr. 1957, p. 532-552.

Outlines engineering design of universal slabbing mill to replace 45 in. x 115-in. high-lift slabbing mill. (W23a, 1-2)

276-W. Developments at the Worthington Iron and Steel Co.'s Plant. *Machinery,* v. 90, May 31, 1957, p. 1239-1241.

A 10-year, $25,000,000 improvement program to enable more efficient production of rails and other permanent-way materials included new coke ovens, boiler house plant and cogging mill, reconstruction and electrification of rail rolling mill, replacement of re-rolling mill. A Bessemer Memorial School was built and equipped for training apprentices, operators and other staff. (W10, W23, 1-2, A3; ST)

277-W. Recent Heat Treat Furnace Installations. *Metallurgia,* v. 55, June 1957, p. 275-293.

Annual survey of developments in design and construction as seen in new installations in Great Britain. Trends are toward heat treat equipment that can be placed in production line with machine tools and furnaces and which will impart greater impact, fatigue and high-temperature strengths to materials treated. (W27, W28, 1-2)

278-W. Lead Melting for Cable Making. Temperature-Controlled Furnace. *Metallurgia,* v. 55, June 1957, p. 293-294.

Principal features of series of 1 to 5-ton furnaces with safety features and temperature control developed by Monometer Mfg. Co. Ltd. (England) for melting of pure lead and lead alloys. (W18, 1-2; Pb)

279-W. Metallurgical Aspects of Calder Hall. Tom Bishop. *Metal Progress,* v. 71, June 1957, p. 65-71.

The first nuclear power plant in the world to produce electricity for general use on a large scale has gone into operation smoothly and satisfactorily, and is fulfilling all the best hopes of its British designers. Metallurgical problems solved include uranium fabrication and canning, selection of steels for pressure vessels, their erection and stress-relief. (W11, T11, 17-7)

280-W. Atmospheric Water Vapor Effects on D-C Arc Electrode Burn-Off Rates. R. H. Benner, 2nd, and T. B. Jones. *Welding Journal,* v. 36, May 1957, p. 263s-264s.

Effects of water vapor content from 0.15 to 16% by volume on the burn-off rate of copper, iron or tungsten; electrodes with arc currents from 20 to 200 amp. 8 ref. (W29h, 1-2)

281-W. (German.) **Coiler in the Age of Rationalization.** Werner Osterland. *Draht,* v. 8, May 1957, p. 176-179.

A review of wire coilers available for common and special winding operations with special emphasis on the extent of automation of each. (W24k, 1-2)

282-W. (German.) **The Grinding Wheel, an Expensive Tool.** Emanuel Fuchs. *Giesserei,* v. 44, June 6, 1957, p. 354-356.

Difficulties encountered in determining the most economic grinding wheel; problems of control of grinding wheel quality; suggestion for a solution of these problems. (W25s, E24j, 1-2)

Instrumentation

Laboratory and Control Equipment

55-X. Portable Thickness Gauge for Industry. S. A. Rybb. *Canadian Metals,* v. 20, Apr. 1957, p. 66-69.

Dawe ultrasonic thickness gage works on resonance principle to major thickness of metals but only one side is accessible; surface preparation and the establishment of good contact between probe and workpiece; applications of instrument for checking wear or corrosion. (X20c, 1-24; Q9, R11)

56-X. Furnace Atmosphere Analyzers. Wayne L. Besselman. *Industrial Heating,* v. 24, May 1957, p. 900-922; disc. p. 926.

Principles governing the operation of analyzers for the measurement and control of furnace and generator atmospheres are explained, including instrumentation for measuring dew point, carbon monoxide, carbon potential, total combustibles and specific gravity. (Z7f, X7g, J2k, 1-2)

55-X. Quartz Vacuum Furnace With Molybdenum and Tungsten Elements for Temperatures up to 3000° K. E. I. Smagina. *Henry Brutcher Translation* No. 3914, 2 p. (From *Zavodskaya Laboratoriya,* v. 22, no. 10, 1956, p. 1249-5Q.) Henry Brutcher, Altadena, Calif.

Special furnace without graphite or carbon heating elements, intended for vacuum synthesis, equilibrium studies at very high temperatures, studies of refractory metals; consists of a quartz tube fitting into a socket in a brass electrode; a heating element of sheet molybdenum for temperatures up to 2000° K. or with a tungsten spiral heating element for temperatures up to 2600° K. and higher. (X24f, 1-3, 1-23)

56-X. (German.) **Home-Made Heater for High-Temperature Metallography Temperature and Its Phenomena.** Irmtraud Pfeiffer. *Zeitschrift für Metallkunde,* v. 48, Apr. 1957, p. 171-175.

Vacuum heater for investigations up to 1100° C. Thermal etching is used to reveal structural details. Examples are: grain boundary movements, transformations and the dissolution of impurities. 7 ref. (X4, 1-2, 2-12, M20q)

57-X. (Japanese.) **Controlling Directionality of Aluminum Sheet. Pt. 3. Some Industrial Methods of Detecting Directionality.** Takuichi Morinaga and Shigeo Zaima. *Light Metals,* v. 7, Mar. 1957, p. 16-22.

New methods using the Knoop indentator or the Harbert pendulum on aluminum and its alloys. They are easily applicable to industrial use without special preparation of the specimen. (X23, F23; Al, 4-3)

58-X. Evaluation of Geiger Counter X-Ray Techniques for Measuring Stresses in Hardened Steels. Karl E. Beu. *American Society for Testing Materials,* Preprint 83, 1957, 8 p.

A "two exposure" X-ray Geiger counter technique for measuring residual and applied stress. A comparison of results published by other observers using similar techniques is given. 14 ref. (X2g, Q25, 1-2; ST)

59-X. Experimental Measurement of Metal-Cutting Temperature Distributions. G. S. Reichenback. *American Society of Mechanical Engineers,* Preprint No. 57-SA-53, June 1957, 15 p. $.50.

Two new methods of measuring cutting temperatures were evaluated. The first is a radiation technique using a lead-sulphide cell. The cell is arranged to sight through a small hole drilled in the work material sensing radiation from the shear plane and clearance face of the tool. The second technique uses a 0.005-in. single wire imbedded in the side of a workpiece as a thermocouple. 24 ref. (X9, 1-2, G-17)

60-X. New Microscope Shows Metals Atom Structure. Leo Seren. *Aviation Age,* v. 21, May 1957, p. 60-65.

An emission microscope which will make it easier to evaluate the structure of materials in terms of creep, fatigue, metal evaporation and radiation damage. (X3p, 1-3)

61-X. Nucleonic Thickness Gauge for Hot Steel Strip. *Process Control and Automation,* v. 4, May 1957, p. 162-165.

A version of the Baldwin nucleonic thickness gage which provides data on mean thickness of each strip, longitudinal profile and transverse profile. (X20c, F23, 1-2; ST, 4-3)

62-X. Tape Controls Inspection Machine. *Steel,* v. 140, May 27, 1957, p. 94-95.

Tape control machines automatically inspect dimensions of variety of parts. (X20, 1-2)

63-X. Thickness Control in Hot Strip Rolling. *British Steelmaker,* v. 23, May 1957, p. 138-141.

Describes installation in hot steel strip rolling mill of a thickness gage dependent on the amount of radiation transmitted through strip; uses strontium 90 and a radiation detector on opposite sides of strip with visual indicator and printed record to follow gage variation; automatically re-calibrates itself between strips. (X20c, F23, 1-16; ST, 4-3)

64-X. New Continuous Gauge. *Iron and Steel,* v. 30, May 1957, p. 171-172.

Gage for measuring hot steel strip thickness consists of radioactive source and detector with recorder and indicating units that respond to variation in strip thickness. (X20c; 4-3)

65-X. Potentionstat as a Metallographic Tool. C. Edeleanu. *Iron and Steel Institute, Journal,* v. 185, Apr. 1957, p. 482-488.

The potentionstat, an instrument which can maintain the potential of a working electrode at any desired value, is shown to be of use for controlling etching, detecting susceptibility to intercrystalline corrosion and in the study of phase diagram of hard chromium-nickel steel alloys. 10 ref. (X14, R11a, 1-3; AY, *Cr, Ni*)

66-X. Width Meter for Hot Steel Strip. C. Burns and B. O. Smith. *Iron and Steel Institute, Journal,* v. 186, June 1957, p. 218-223.

Width meter for hot rolled strip obtains readings by combining indications from two optical units sensitive to infra-red radiations from the strip, mounted several feet above the edges of strip. Experimental unit described demonstrated that width could be read to plus or minus 1/16-in., with a speed response of 0.15 sec. Commercial instruments based on principle described being manufactured. (X20, F23; ST, 4-3)

67-X. Economical Resistance-Type Controller for Platinum-Wound Furnaces. R. J. Newman. *Metallurgia,* v. 55, May 1957, p. 260-261.

Temperature controller for resistance furnaces with platinum alloy windings in which control signal is obtained by monitoring resistance of the winding; advantages and possible sources of error. (X9s, 1-2)

68-X. (French.) **New Measurements of Gyromagnetic Ratios of Iron and Nickel.** André J. P. Meyer and Sheldon Brown. *Journal de Physique et le Radium,* v. 18, Mar. 1957, p. 161-168.

New instrument for measuring Einstein-Haas effect; correction of precious systematic error; method of using instrument; discussion of results. 12 ref. (X26, 1-3; Fe, Ni)

Scientists ...

Engineers

A message from M. A. Schultz, Project Manager

Westinghouse Commercial Atomic Power

"We are developing the first industry-owned, high-powered Testing Reactor—the *Westinghouse Test Reactor.* It will enable private industry and the government to test materials under conditions of high neutron flux, high temperature and high pressure.

"Here at APD, we are continually *pioneering* peacetime atomic power projects. The Westinghouse Testing Reactor is only one of many now under way. Sound interesting? Why not let us tell you more?"

An Experienced, Young, Fast-Growing Team

APD—Atomic Power Department—is the most dynamic new division at Westinghouse. We're "fluid," not fixed. Supervisory jobs open up fast!

Our growth curve is bound to be *steep*—as electric power demand and atomic power production pyramid sharply. We're entirely *commercial*—not dependent on government subsidy. Opportunities for advanced study at company expense. Get in on the "industry of tomorrow" *today*—at Westinghouse APD.

Immediate openings

. . . for Physicists • Physical Chemists • Chemical Engineers • Mechanical Engineers • Electrical Engineers • Designers • Metallurgists.

Send résumé to:

C. S. Southard, Westinghouse Atomic Power Department, Box 355, Dept. 134, Pittsburgh 30, Pa.

WESTINGHOUSE

FIRST IN ATOMIC POWER

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

East

RESEARCH ENGINEER: Young engineer with 3 to 5 years experience in field related to metallurgical research. Must have engineering degree and complete knowledge of basic sciences. Work will be developing specialized alloys and their production methods in the nonferrous field. We have facilities for subjecting standard and other metals and their alloys to chemical, physical and electrical tests. Box 8-15.

PROFESSORIAL CHAIR: Metallurgy or Physics of Metals. No administrative assignments. Starting salary $15,000 per year, September 1958 appointment. Recommendations as well as applications solicited. Box 8-20.

PROCESS ENGINEER: Connecticut investment casting company offers excellent position to young mechanical or metallurgical engineer. Non-degree but experienced applicant acceptable. Opportunity for ambitious man. Box 8-25.

TEACHING OPPORTUNITY: Privately endowed eastern college offering engineering and liberal arts degrees is expanding metallurgical engineering department. Rank and salary open. Teaching ability in any metallurgical field can be used. Reasonable teaching load. Position open Sept. 1, 1957. Location of school and facilities attractive for man to engage in consulting and research. Graduate studies offered at nearby locations. Box 8-35.

INSTRUCTOR: In technical subjects, including metallurgy, science, applied mechanics and mathematics. Technical high-school level. Six years industrial experience with B.S. degree required. Salary $5000 to $8000 for ten months. Write to: Wilmington Public Schools, Vocational Dept., 511 W. 8th St., Wilmington, Del. Position open Sept. 1.

Midwest

METALLURGY TEACHER: Primarily in physical metallurgy for undergraduate and graduate courses. A sincere interest in X-ray metallography desirable. Opportunity for salary augmentation by sponsored research. Base salary dependent on qualifications. Write to: Dept. of Metallurgical Engineering, University of Kentucky, Lexington, Ky.

TOOL METALLURGIST: Nationally known metal fastenings manufacturer has excellent opening for metallurgist with several years experience to work on tool and die metallurgy. Will develop and carry out program of tool material selection, tool and die heat treatment, productivity of tools. Replies held in strict confidence, should include details of education, work experience, salary requirements. Box 8-30.

YOUNG MAN: To assist president of industrial furnace manufacturer. Opportunity to acquire interest in business either by investment or at a later date by accomplishments. Furnace experience, all types, necessary. Box 8-125.

METALLURGISTS: B.S. degrees. (1) Five years experience with at least two years in nonferrous casting for research and development assignments. Capable of conducting programs and writing comprehensive reports. (2) Three years experience in strip mill operations or five years nonferrous metal plant experience. Will be assigned to mill or research and development work. Ability to establish, supervise and analyze projects with minimum supervision. These positions are with a prominent nonferrous producer and offer substantial growth prospects. Graduate study facilities available in local area. Liberal relocation assistance. Submit past experience, salary history and salary requirements in confidence. Box 8-130.

South

SUPERVISOR-OPERATOR: Heat treating and electroplating division of newly formed Florida corporation. Requires ability to produce work of highest quality and precision. Some financial participation desirable. Box 8-40.

Southwest

METALLURGIST: For laboratory position in production development. Work will include development of new processes and obtaining design data through laboratory methods. Salary commensurate with ability and experience. Box 8-120.

Government

METALLURGISTS: Grades GS-9 and GS-11, $6115 and $7035 per annum, in Metals and Metallurgy Branch, Research and Development Division, Bureau of Ships. Involves responsibility for directing or assisting higher grade metallurgist in research and development projects concerning nonferrous metals, corrosion-resisting metals, steel casting, magnetic and nonmagnetic metals, or high-temperature electronic metals; reviewing laboratory tests of these metals, studying literature and other reports, and recommending suitability to Bureau usage; reviewing and drafting new or revised procurement specifications; conferring with Bureau personnel and commercial contractors concerning physical properties and behavior of above metals. For GS-9, requirements include B.S. degree from accredited college or university, with courses in metallurgical subjects totaling at least 20 semester hours, plus 1½ years progressive professional experience in metals. For GS-11, requirements include B.S. degree with 20 semester hours metallurgical subjects and 2½ years experience. Applications should be sent to: Dept. of the Navy, Bureau of Ships, Code 263R, Washington 25, D.C.

POSITION WANTED

METALLURGICAL ENGINEER: B.S. degree, age 34, married, family, veteran. Eight years experience with ferrous and nonferrous alloys, including high-temperature materials. Background includes failure analysis, manufacturing problems, material evaluation, laboratory supervision. Would like to locate in Southern New England as metallurgist for small company. Box 8-45.

METALLURGICAL ENGINEER: M.S.E. degree. Seven years industrial experience in vacuum and inert atmosphere melting, air melting, investment casting, alloy development, materials specification, heat treating, ceramics, design. Also staff level management technical advisor. Production or development desired. Present salary $11,000. Box 8-50.

METALLURGIST: D. Eng. Sc. degree, married, age 29. Background includes fundamental research in physical and mechanical metallurgy specializing in fracture and plastic properties of ferrous and nonferrous materials;

Graham Laboratory, Jones & Laughlin's modern research center in Pittsburgh, Pa.

RESEARCH METALLURGISTS

Several attractive openings are available for metallurgists, with graduate level training or equivalent research experience, to participate in expanding research and development programs in PROCESS, PRODUCT, AND PHYSICAL METALLURGY.

Work will be carried out in our modern laboratories in suburban Pittsburgh. Excellent opportunities are available for professional advancement in a young and growing organization.

Send resume, in confidence, to:

J. A. Hill
Research and Development Department
JONES & LAUGHLIN STEEL CORPORATION
3 Gateway Center
Pittsburgh 30, Pennsylvania

J&L STEEL

Dallas Metal Show has been added — to your Sales Territory . . .

The great Southwest — the industrial Southwest—rich, growing, bustling — is waiting for you. Here's a new sales territory that means profits for modern-day pioneers.

There'll be thousands of *new* prospective customers who'll crowd the Southwestern Metal Show — to see your company's display — to hear your company's story — to buy your company's product.

Over two million people live and work within a day's drive of Dallas. They are your prospects, interested in all that's new and improved. This is a chance you can't afford to miss.

Mark those five days next May as the "Days that Pay". You'll find them just that, because thousands will be at the Dallas Metal Show, searching for production advantages that will help improve operations, services, products — and at lower costs.

These prospects will be ready to buy. They'll be "preconditioned" — for the great Southwest is on the march, sparking sales to improve its own business economy.

ASM Metal Shows are famous as sales stimulants. They are "musts" for any firm with an eye on an expanded tomorrow. Here in the Southwestern Metal Show is a rich metal market full of opportunity for the prospecting manufacturer. Here's a show that will out-draw, out-sell and surpass anything you've experienced before in the "great open spaces."

STATE FAIR PARK

DALLAS, TEXAS

MAY 12-16, 1958

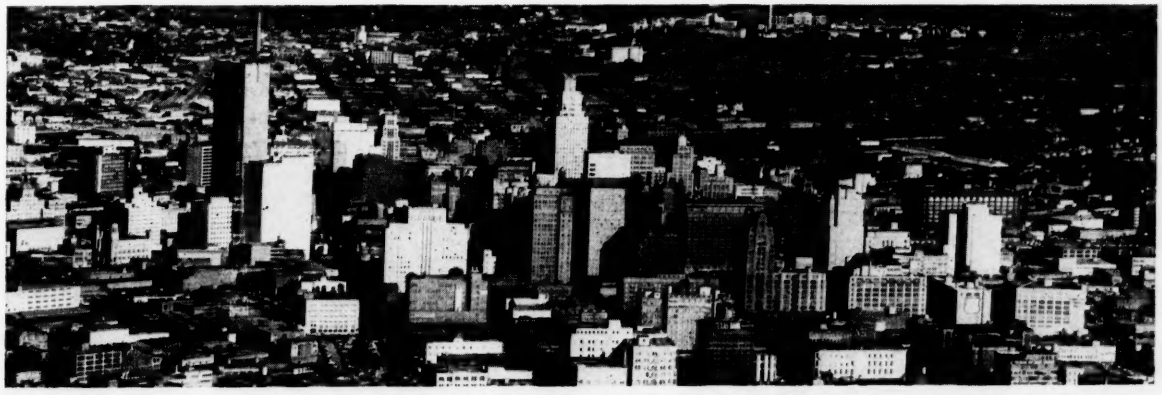
Because the Show is staged in Dallas' spacious State Fair Park, only two miles from the city's center and downtown hotels, you'll be able to put your best foot forward before a top level audience looking for just what you've got to offer. There never was a finer exhibition hall — all on one level — airy, bright. It puts visitors in the right frame of mind to buy. It will be bristling with ideas and thronged with buyers.

Get your share of this new market. The Southwestern Metal Show is the place to sell! Act today — select your space. If you don't have floor plans, write us NOW. You'll reap a harvest from this new and finer Metal Show. To assure success in '58 — Don't Hesitate!

Southwestern Metal Exposition

W. H. EISENMAN, *Managing Director* • CHESTER L. WELLS, *Assistant Director*

7301 EUCLID AVENUE • CLEVELAND 3, OHIO • TELEPHONE: UTAH 1-0200



State Fair Park Is Only Two Miles from Downtown Hotels

METAL SHOWS OWNED AND OPERATED BY THE AMERICAN SOCIETY FOR METALS

supervision of research projects; teaching on both undergraduate and graduate levels. Desires responsible position in basic research or one utilizing fundamental approaches to applied problems. Box 8-55.

SALES ENGINEER: Experienced in heat, corrosion resisting castings, fabrications. Ten years diversified business experience, five in sales. Age 31, married, two dependents. Business college graduate, own home, late model car. Has extensively covered 100 miles around New York City and New England and Philadelphia. New Jersey resident. No relocation. Desires challenging opportunity with reliable firm, large or small. $7 to 8000. Box 8-60.

SALES ENGINEERING: By development engineer. Nonferrous foundry, extrusion, heat treating; glass and ceramic coatings; architectural ceramics and metals; hot pressing and sintering of nuclear materials; chemical steel treatment; corrosion studies; AEC "Q" clearance. B.Ch.E. degree in 1940, P.E., plus training in economics and marketing. Little sales experience but high sales aptitude rating. Box 8-65.

METALLURGICAL ENGINEER: B.S. degree, age 36, married, family. Eight years diversified experience including product development, failure analysis, consultation in selection, application and processing of plain carbon, alloy, tool and die steels, and high-temperature materials. Development work on high-temperature brazing alloys, high-strength steels and welding electrodes. All phases of laboratory work including metallography, physical testing and heat treatment. Desires responsible position in Chicago area. Box 8-70.

METALLURGIST: Age 39, B.S. and M.S. degrees. Extensive background in all phases of steel and aluminum heat treatment as well as electroplating, welding and brazing. Experience well balanced in technical, production and administrative phases. Desires position in responsible charge of heat treating and electroplating operations, Midwest. Box 8-75.

METALLURGIST: Degree corresponding halfway between B.S. and M.S. in mechanical engineering, age 27, Italian now working in Mexico. Presently employed as supervisor of heat treating, phosphate coatings, physical and metallographic laboratory and as chief of inspection department in automotive field. Has worked in steel production plants and in metallurgical research laboratories. Knows Italian and Spanish perfectly, able to speak and write some English, French and German. Prefers United States but will consider opportunities anywhere in the world. Box 8-80.

METALLURGISTS

Fansteel leads in the development and processing of columbium, molybdenum, tantalum and tungsten and in addition manufactures contacts, rectifiers, capacitors and chemical equipment. The company has a history of growth and offers good starting salaries, opportunity to do creative work, association with top men in the field and the recreational and cultural advantages of suburban living, just 35 miles north of Chicago's Loop. Please send complete resume to:

Technical Employment Dept.
Fansteel Metallurgical Corp.
2200 Sheridan Rd.
North Chicago, Ill.

PATENT ATTORNEY

Challenging opportunity for a Patent Attorney exists in the General Offices of a well-established specialty steel company. Pittsburgh location. Exceptional employee benefit programs.

Applicant must have technical undergraduate background; i.e. metallurgy, chemical engineering, chemistry, mechanical engineering and an LL. B. This position does not require heavy patent law experience; however, the incumbent must be able to work well with others and have a good knowledge of the basic tools in the Patent Law area.

Ability and experience will receive recognition in salary consideration. All replies will be treated confidentially. Please submit personal resume including educational background, experience and salary desired to:

Mr. J. E. Harris
CRUCIBLE STEEL CO. OF AMERICA
P.O. Box 88
Pittsburgh 30, Pennsylvania

IMMEDIATE OPENING

CRUCIBLE STEEL CO. OF AMERICA

Central Research Laboratory
Pittsburgh, Pennsylvania

CERAMIST

Requires advanced degree in ceramics or physical chemistry coupled with at least ten years' experience in refractories, powder metallurgy, magnetic materials, etc., to direct challenging research problems in these fields.

Send resume in complete confidence

Mr. E. J. Martin
CRUCIBLE STEEL CO. OF AMERICA
P. O. Box 88
Pittsburgh 30, Pa.

METALLURGICAL ENGINEER

Leading producer of high temperature alloy products needs young experienced graduate metallurgist for metallurgical control of processing and new projects. Must have ability to supervise lab technicians and observers and to generally handle the metallurgical problems in a plant of our division. Titanium experience desirable as well as knowledge of forging techniques.

Salary competitive with best plus liberal fringe benefits including education. Expanding dynamic industry offering wide opportunity and challenge to men with ability and desire to accept responsibility. Excellent location in Upstate New York.

Please send resume including salary requirements. All replies will be treated in strict confidence.

Box 8-135 Metals Review

RESEARCH METALLOGRAPHER

To head up Metallurgical laboratory working with titanium and high-temperature alloys used in jet engines. Must have at least five years experience in all types of physical testing. Aptitude for high-grade photomicroscopy essential. Liberal salary, bonus and fringe benefits. Send resume to H. A. Ford, Personnel Department

UTICA DROP FORGE & TOOL
Division of
KELSEY-HAYES CO.
Utica, N. Y.

SALESMAN - METAL FINISHING PRODUCTS

Man with experience in selling metal finishing products to cover Pennsylvania territory and to supervise sales in balance of eastern United States for nationally known manufacturer. Good starting salary, full travel expenses and bonus. Reply in detail for interview appointment.

Box 8-10, Metals Review

SECTION HEAD
PHYSICAL METALLURGY

Expanding research organization needs experienced man to supervise a variety of projects in physical metallurgy. Excellent opportunity to grow with the organization. Exceptionally pleasant working conditions.

Send resume to

SOUTHERN RESEARCH INSTITUTE
Birmingham 5, Alabama

IMMEDIATE OPENING

CRUCIBLE STEEL CO. OF AMERICA

Central Research Laboratory
Pittsburgh, Pennsylvania

MECHANICAL ENGINEER

Requires advanced degree in mechanical engineering or metallurgy with experience in both technical disciplines. Should have a minimum of ten years' experience in development of metal working processes and equipment. Competence in handling engineers associated with the working of metals is desirable.

Send resume in complete confidence to

Mr. E. J. Martin
CRUCIBLE STEEL CO. OF AMERICA
P.O. Box 88
Pittsburgh 30, Pa.

METALLURGIST: B.S. degree plus graduate studies in chemistry, metallurgy and physics. Extensive experience in physical metallurgy and materials application—welding, brazing, light metals, steel and titanium. Desires position requiring broad metallurgical knowledge with small or medium-size company. Will relocate. Box 8-85.

METALLOGRAPHER - LABORATORY ASSISTANT: High-school graduate, ago 36. Substantial experience in operating metallurgical laboratory equipment including metallography, X-ray, tensile and impact testers. Also experience in writing technical reports, assembling, operating and maintaining electronic equipment. Desires position in York, Lancaster, Harrisburg section of Pennsylvania. Box 8-90.

METALLURGICAL-WELDING ENGINEER: B.S. in metallurgical engineering, age 38. Fifteen years experience in physical metallurgy as applied to the design and manufacture of fabricated products. Highly qualified to apply the most modern welding processes to manufacturing operations. Has had substantial supervisory experience. Desires position as chief metallurgist or welding engineer. East or South. Box 8-95.

METALLURGICAL ENGINEER: B.S. and M.S. degrees, age 24, single. Presently employed as associate nuclear engineer. Experience includes brazing, roll cladding, powder metallurgy of nuclear and non-nuclear materials. Must relocate to New York-Connecticut-New Jersey area and desires position with firm that can offer a solid engineering background to a young engineer. Box 8-100.

METALLURGICAL ENGINEER: Age 39, married. Supervisory level experience in fields of high-temperature alloy fabrication, noferrous foundry, materials engineering. Director of laboratories performing metallography, physical testing, radiography. Desires work requiring administrative and technical ability in medium-sized industry with challenging problems. Present salary $10,500. Box 8-105.

METALLURGICAL ENGINEER: B. Met. E. degree, age 27, family, veteran. Four years of diversified research and development activity in physical metallurgy. Last two years in metallurgy of soft magnetic materials. Earlier experience in metallography, foundry, bearing material study, heat treatment. Desires development or production control position in East. Box 8-110.

CHEMIST-METALLURGIST: M.S. in chemistry. Additional technical and business schooling. As chief of laboratories in engineering department of appliance manufacturer, has had extensive experience in materials selection, processing, trouble-shooting, corrosion; research and development including mechanical projects; instrumentation; fuels, refrigeration and gas chemistry including high pressure; technical writing and some lecturing. Cooperates well. Available for responsible position to apply this experience. Greater Cleveland location. Box 8-115.

TECHNICAL MANAGER AND SUPERVISOR: B.S. degree in chemical engineering. Twenty years diversified technical supervision and management, various phases. Last 12 years in technical management with producer of copper and brass and aluminum products. Would be interested in discussing connection with progressive company in this field. Presently employed. Box 8-140.

METALLURGICAL ENGINEER: Age 34, single, Ph.D. degree in metallurgy. Professional mechanical engineer with worldwide experience in welding, casting and high-temperature development work as well as in production supervision and operations research. Desires suitable executive research, development or technical control position. Present location West Coast but willing to relocate. Box 8-145.

METALLURGICAL ENGINEER: B.S. degree, University of Pittsburgh. Fifteen years experience in all phases of special alloy, magnetic materials, Alnico permanent magnet manufacture, including metallurgy, foundry practice, induction melting, heat treating, plant tooling, maintenance, supervision, plant organization, employee relations, research and design. Five years experience in iron and steel castings and roll casting, metallurgy, foundry practice, heat treatment. Has had patents issued and papers published. Complete resume on request. Box 8-150.

IMMEDIATE OPENING

CRUCIBLE STEEL CO. OF AMERICA

Central Research Laboratory
Pittsburgh, Pennsylvania

APPLIED RESEARCH PHYSICIST

Requires advanced degree in physics or mathematics to undertake high level research activity in solid state of ferrous alloy systems and nonmetallic magnetic materials.

Send resume in complete confidence

Mr. E. J. Martin
CRUCIBLE STEEL CO. OF AMERICA
P.O. Box 88
Pittsburgh 30, Pa.

IMMEDIATE OPENING

CRUCIBLE STEEL CO. OF AMERICA

Central Research Laboratory
Pittsburgh, Pennsylvania

METALLURGIST

To direct research activities on stainless steel. Should have a minimum of ten years in physical metallurgy and comprehensive knowledge of fabrication, application, and testing of all varieties of stainless steel.

Send resume in complete confidence

Mr. E. J. Martin
CRUCIBLE STEEL CO. OF AMERICA
P. O. Box 88
Pittsburgh 30, Pa.

HERE'S HOW . . .

To get copies of articles annotated in the A.S.M. Review of Current Metal Literature

Two alternative methods are:

1. Write to the original source of the article asking for tear sheets, a reprint or a copy of the issue in which it appeared. A list of addresses of the periodicals annotated is available on request.

2. Order photostatic copies from the New York Public Library, New York City, from the Carnegie Library of Pittsburgh, 4400 Forbes St., Pittsburgh 13, Pa., or from the Engineering Societies Library, 29 West 39th St., New York 18, N. Y. A nominal charge is made, varying with the length of the article and page size of the periodical.

Write to Metals Review for free copy of the address list

METALS REVIEW

7301 Euclid Avenue **Cleveland 3, Ohio**

NOW READY FOR PRODUCTION!

The All-New

B-58

America's FIRST Supersonic Bomber

• Welding Engineers
• Metallurgists

Recent graduates and non-graduates with sufficient experience to develop metallurgical processes and solve production problems in welding and heat treating of ferrous and non-ferrous metals for the all-new B-58. Work in America's largest and finest aircraft manufacturing facility, enjoy pleasant suburban living with metropolitan educational and cultural facilities, salary and employee benefits that are tops in the industry. With nearly half-a-hundred Air Force contracts on hand, your future is *NOW* . . . at Convair!

Send resume of training and experience to:

MR. B. R. TOUDOUZE
CONVAIR
FORT WORTH
FORT WORTH, TEXAS
CONVAIR IS A DIVISION OF GENERAL DYNAMICS CORPORATION

Manufacturer of heat treating equipment offers excellent opportunities for:

- **EUROPEAN SALES MANAGER**

  This man will be in charge of our Kleve, Germany, office . . . and will supervise marketing activities in Germany, Italy, France, and England. He will have previous experience in the sale of heat treating equipment, and will be able to speak the necessary foreign languages.

- **EXPERIENCED FURNACE DESIGNERS AND DETAILERS**
- **FURNACE ENGINEERS**
- **SERVICE TRAINEES TO WORK INTO SALES**

  These positions are for men with ideas, imagination, and push . . . men who won't be held down by tradition . . . men who like to throw the book out the window. Successful applicants will find that Ipsen offers many different opportunities which will permit them to take advantage of their particular experience in the design, production, sales, or service of heat treating equipment.

Ipsen IPSEN INDUSTRIES, INC.

715 SOUTH MAIN ST., ROCKFORD, ILL.

ENGINEERS

You Have an Excellent Future Working for

CATERPILLAR TRACTOR CO.

THE WORLD'S LEADER

In the field of Crawler Tractors, Motor Graders, Diesel Engines and Earthmoving Equipment.

Due to vast expansion program, excellent opportunities exist in our Sales (Graduate Engineers), Service, Research, Manufacturing and Engineering Departments for:

Mechanical	**Metallurgical**
Electrical	**Chemical**
Civil (Recent Graduates)	**Physicists**
Agricultural	**Architects**
Mathematicians (Computers)	**Estimators**

Interested persons may send resume to Mr. P. C. Perry, Professional Employment Coordinator. All inquiries will be treated on a confidential basis.

EMPLOYMENT DIVISION

CATERPILLAR TRACTOR CO.

Peoria, Illinois

IMMEDIATE OPPORTUNITIES IN HIGH TEMPERATURE MATERIALS RESEARCH

Research Metallurgists are urgently needed for immediate openings in the modern and expanding Materials Research Laboratory of one of America's leading Research and Development Organizations — now engaged in missile development and other advanced projects.

You'll enjoy professional responsibility, fine salaries — and advancement based on individual contribution. All activities are conducted in a stimulating scientific atmosphere with top-level associates.

In addition, you'll be offered a completely modern fringe benefit program, including an excellent company sponsored educational plan.

OPENINGS:

RESEARCH METALLURGISTS

with 2 to 5 years experience in

- Metals Processing (B.S.)
- Development Engineering (B.S.)
- Physical Testing (B.S.)
- Powder Metallurgy (M.S. with 5 to 10 years experience)

Other important openings in this field (2 to 5 years experience required) include:

- Analytical Chemist (Ph. D.)
- Specifications Engineer (B.S. in Engineering)
- Physicist — Non-Destructive Test (B.S.)
- Research Ceramist (Ceramics and Cermets) (M.S. or Ph. D.)

Please send your resume to: E. W. STUPACK, Personnel Manager, Dept. MR. Your reply will be held in strictest confidence and will receive prompt attention.

avco *Research and Advanced Development* division

AVCO MANUFACTURING CORPORATION

20 South Union Street, Lawrence, Mass.

METALLURGIST

Exceptional opportunity for young Metallurgist in our recently organized

RESEARCH DIVISION

Applicant should have some experience applicable to the field of high temperature, high strength materials in the normally corrosive environments of modern steam electric generating stations. He would also deal with problems of fatigue in high speed rotor forgings, non-destructive testing of high temperature high pressure piping, etc.

Excellent working conditions and personnel benefits, such as Group Insurance, Vacations, Annuity, Holidays, etc.

Send reply and resume with salary desired to

G. L. Harvey, Jr., Director-Employment

PHILADELPHIA ELECTRIC COMPANY

1000 Chestnut St., Phila. 5, Pa.

METALLURGISTS

Pacific Semiconductors, Inc., a subsidiary of The Ramo-Wooldridge Corporation, has openings for metallurgists to contribute to the research and development programs in semiconductor materials. An M.S. or Ph.D. degree in metallurgy or physics is required plus experience or interest in germanium, silicon, or infra-red techniques. Salary commensurate with training and experience. For further information write J. C. Ross, Jr., Industrial Relations Manager, 10451 W. Jefferson Boulevard, Culver City, California.

METALLURGIST
RESEARCH AND DEVELOPMENT

We have an opening in our Materials and Processes Section for a metallurgist or chemical engineer who is interested in a career in die casting. We have exceptional laboratory and production facilities, and a chance for you to grow with us. Extra benefits include retirement plan, patent and imagineering awards and advanced educational grants. Stimulating research program and working companions. Excellent suburban living conditions. Write for interview.

Mr. Frank A. Martin
The Hoover Company
North Canton, Ohio

2 RESEARCH METALLURGISTS

Masters or Ph.D. degrees preferred. 25 to 35 years of age. Work in applied research, dealing with welding of ferrous and non-ferrous alloys, investigation of service problems, and selection of materials of construction.

Applicants should have experience in the application of metallurgy to production problems.

C F BRAUN & CO
Alhambra, California
Engineers and Constructors

Permanent Positions

X RAY METALLURGY
Preferred Orientation, Phase Identification, Transformation, and special problems.

PHYSICAL METALLURGY
Alloy development, Constitution, and properties.

MECHANICAL METALLURGY
Development of metal working techniques and correlation with properties.

PROCESS METALLURGY
Pilot development of new alloys and processes, special orders, quality control.

PROCESS ENGINEERING
Mechanical and economic aspects of non-ferrous strip, rod, and tube mill operations.

with
EXPANDING
ORGANIZATION

in non-ferrous products offering excellent opportunities for advancement.

Liberal salaries and employee benefits.

Locations:

Southern Connecticut and Midwest.

We are interested in applicants at all levels of experience.

Write

Mr. T. F. Burns
Employment Mgr.

Bridgeport Brass Co.

30 Grand St., Bridgeport 2, Connecticut

HIGH TEMPERATURE MATERIALS RESEARCH

If you have had professional experience and are ready to move into increased responsibilities—contact us.

We have openings for scientists with either advanced or limited experience.

BEARING AND FRICTION MATERIALS
Study phenomena associated with moving surfaces to develop bearings and seals to operate in high-temperature, corrosive and nuclear environments.

NUCLEAR MATERIALS
Develop materials and fabrication methods for nuclear components such as fuel elements and control rods.
Research on high-temperature reactions, determination of physical properties, development of novel methods of fabrication of materials that will be employed in future nuclear applications.

REFRACTORY MATERIALS
Research on high-temperature materials and techniques for processing components to be used in the new automotive and aircraft engines.

Clevite Research Center develops new principles and new products for other units of Clevite Corporation. The Research Center provides the ideal environment for the engineer because it has been supplied with the facilities, equipment and library to provide new knowledge and new products for Clevite Corporation, a company whose entire product line is in the growth fields of electronics, semiconductors, and automotive and aircraft power plants.

Write E. A. Gentry or Call ULster 1-5500 Collect
CLEVITE RESEARCH CENTER
540 E. 105th Street
Cleveland 8, Ohio

....A Notable Coincidence

The Second World Metallurgical Congress

Entries Will Be Expected From All Over the World—Display Your Best Work

CLASSIFICATION OF ENTRIES

(Optical and Electron)

Class 1. Irons and steels.
Class 2. Stainless steels and heat resisting alloys.
Class 3. Aluminum, magnesium, beryllium, titanium and their alloys.
Class 4. Copper, nickel, zinc, lead and their alloys.
Class 5. Uranium, plutonium, thorium, zirconium and reactor fuel and control elements.
Class 6. Metals and alloys not otherwise classified.
Class 7. Series showing transitions by changes during processing.
Class 8. Welds and other joining methods.
Class 9. Surface coatings and surface phenomena.
Class 10. Results by unconventional techniques (other than electron micrographs).
Class 11. Slags, inclusions, refractories, cermets and aggregates.
Class 12. Color prints in any of the above classes. (No transparencies accepted.)

AWARDS AND OTHER INFORMATION

A committee of judges will be appointed by the Metal Congress management which will award a First Prize (a medal and blue ribbon) to the best in each classification. Honorable Mentions will also be awarded (with appropriate medals) to other photographs which, in the opinion of the judges, closely approach the winner in excellence. A Grand Prize, in the form of an engrossed certificate and a money award of $100, will also be awarded the exhibitor whose work is judged best in the show, and his exhibit shall become the property of the American Society for Metals for preservation and display in the Society's national headquarters in Cleveland.

All photographs may be retained by the Society for one year and placed in a traveling exhibit to the various Chapters. They will be returned to the owners in May 1958 if so desired.

RULES FOR ENTRANTS

Exhibitors do not need to be members of the American Society for Metals.

Work which has appeared in previous metallographic exhibits held by the American Society for Metals is unacceptable.

Photographic prints should be mounted on stiff cardboard; maximum dimensions 24 by 28 in. (61 by 45 cm.). Heavy, solid frames are unacceptable.

Entries should carry a label on the back of the mount giving:

Classification of entry.

Material, treatment, magnification.

Any special information as desired.

The name, company affiliation and postal address of the exhibitor should be placed on the back of the mount.

Entrants living outside the U. S. A. should send their micros by first-class letter mail endorsed "Photo for Exhibition—May be Opened for Customs Inspection".

Exhibits must be delivered before Oct. 15, 1957, either by prepaid express, registered parcel post or first-class letter mail, addressed:

Metallographic Exhibit
American Society for Metals
7301 Euclid Ave.
Cleveland 3, Ohio, U.S.A.

FLASH! Award for Excellence in Metallography will be the "Francis F. Lucas Grand Prize" Valued at $500 and Endowed by Adolph E. Buehler

The Twelfth

Metallographic Exhibit

Chicago, Illinois, November 2 to 8, 1957

manufacturer of furnaces needs:

RESEARCH METALLURGIST

Experienced in metallurgy, capable of supervising performance tests on controlled atmosphere furnaces, both electric and fuel fired. Able to analyze his findings and present them intelligently to management, and the technical press. Original research encouraged. Local ASM participation required.

modern commercial heat treater needs:

METALLURGICAL ENGINEER

To head up completely modern laboratory and supervise present experienced technicians, cooperate in furnace testing projects, prepare photographs, reports on lab work, etc. Three or four years of experience since graduation is desirable. ASM participation is a must.

chief engineer needs:

EXPERIENCED FURNACE ENGINEER

To help break a bottleneck by analyzing, designing, and producing working drawings of controlled atmosphere industrial furnaces, both gas and electric, from sales specifications.

Write to
Marketing Manager

IPSEN INDUSTRIES, Inc.
715 S. Main St. • Rockford, Ill.

Ipsen

RESEARCH METALLURGIST

Mechanical Metallurgist to do basic research in the flow of metals during hot working.

Advanced degree in Metallurgy or several years research experience in the hot working of metals.

Company sponsored research using excellent experimental facilities.

Write or Phone

W. A. Johnson

Associate Director of Research

THOMPSON PRODUCTS, INC.

23555 Euclid Avenue
Cleveland 17, Ohio

WELDING DEVELOPMENT ENGINEERS

A new welding laboratory and our expanding development program to accommodate a wide variety of diversified product lines necessitates increasing our present staff. Engineers interested in welding development and having up to 10 years experience are needed. Excellent employee benefits.

Send detailed resume and salary requirements to:

ALCO PRODUCTS, INC.
Employee Services Department
Schenectady 5, New York

HORIZONS.....

Has open supervisory research positions in expanding Metallurgy Department in the fields of physical metallurgy, mechanical metallurgy, physical chemistry, precision casting and powder metallurgy. Unusual opportunities for individual diversification, intellectual advancement and personal stimulation. Please apply to Laboratory Manager:

HORIZONS INCORPORATED
2905 East 79th Street
Cleveland 4, Ohio

Metallurgists *and* Powder Metallurgists

career openings at IBM®

Airborne Computer Laboratory at Owego, N. Y. A new facility, created to provide metallurgical support to Engineering and Production Departments, offers ground-floor opportunities to graduate Metallurgical Engineers. Salary commensurate with experience and abilities. Must have metallurgical process experience in a material or technical services laboratory.

Write, outlining qualifications and experience to:

Mr. P. E. Strohm
Airborne Computer Laboratories
IBM Corp., Owego, N. Y.

Product Development Laboratory at Poughkeepsie, N.Y., offers career opportunities to Powder Metallurgists with a B.S., M.S., or Ph.D. in Metallurgical Engineering. Must have 4 to 5 years' experience in sintered metals, and qualified to direct major projects in the development and application of sintered metal parts and techniques for electronic and mechanical components.

Write, outlining qualifications and experience to:

Mr. C. R. Chase
Product Development Laboratory
IBM Corp., Boardman Rd.,
Poughkeepsie, N. Y.

IBM's Advantages

- Moving and travel expenses paid
- Excellent starting salaries and liberal company benefits
- IBM's lab personnel has increased 500% in the last five years
- Small-team system and advancement based on merit

INTERNATIONAL BUSINESS MACHINES CORPORATION

FOUNDRY RESEARCH SUPERVISOR

Well-known research organization has excellent opportunity for a man with minimum of 10 years practical Foundry experience and good fundamental knowledge of metallurgy. This individual will supervise the diversified technical programs of the Foundry Section of our large Metals Research Department. He should have a minimum of a B.S. degree, be capable of directing a variety of Foundry activities as well as maintaining close customer contact.

Located in the Midwest, we offer a generous relocation allowance along with excellent vacation, insurance and retirement benefits, and the opportunity for professional and personal growth.

Please send complete resume. All replies will be treated as confidential.

Box 8-5, Metals Review

METALLURGISTS

Recent graduates with less than three years experience wanted for research on:

Silicon Steels
High-Temperature Alloys
Permanent Magnet Materials
Constructional Alloys
Stainless Steels

Crucible Steel Company of America offers challenging problems, opportunities, job security and comprehensive fringe benefits through its alert, aggressive management.

Send complete resume to

Mr. J. E. Harris
CRUCIBLE STEEL COMPANY OF AMERICA
P.O. Box 88 Pittsburgh 30, Pa.

MAKE RESERVATIONS NOW . . . . .

Have you made your reservation yet for hotel room space during your visit to the 39th National Metal Congress and Exposition

Nov. 2-8, 1957
Chicago

If not, immediate action is urged by the A.S.M. Housing Committee.

Write to:

Metal Show Housing Bureau
c/o Chicago Convention Bureau, Inc.
134 North LaSalle St.—Suite 900
Chicago 2, Ill.

METALLURGIST

Supervisory position in aircraft plant. Graduate capable of solving production problems, writing technical reports and conducting metallurgical investigations. Preferably with some experience with heat and corrosion resistant alloys. Salary commensurate with experience. For personal interview contact Mr. J. D. Batten.

SOLAR AIRCRAFT COMPANY
Des Moines, Iowa

Learn about the ductility of chromium!

Sponsored by . . .
U.S. ARMY ORDNANCE
45 Technical experts

Based on ASM Metal Congress Proceedings

Section Headings . . .

1. **General Review**
2. **Production of Chromium Metal**
3. **Ductile Chromium Metal**
4. **Effect of Gas on Chromium Metal**
5. **High-Chromium Alloys**

NEW ASM Book on

DUCTILE CHROMIUM

- ***376 pages***
- ***Illustrations***
- ***6 x 9***
- ***Red cloth***

$7.50

Clip and send

AMERICAN SOCIETY FOR METALS
7301 Euclid Ave., Cleveland 3, Ohio

Name _____
Address _____
City _____ Zone _____ State _____
Check or Money Order Enclosed ☐ Bill Me ☐
Ductile Chromium $7.50 .....

39th National Metal Exposition

Thousands of products will be displayed by more than 500 metalworking firms in the vast exhibit areas of Chicago's International Amphitheatre and Exposition Hall, Monday through Friday, November 4 to 8. 50,000 experts from the United Statees and the free world will meet with you.

2nd World Metallurgical Congress

Years of intensive effort have gone into this world event. Overseas scientists and engineers will attend from 38 countries of the free world. They will exchange ideas with you, present their own technical and practical papers.

You will want to be in Chicago the week of November 4.

You will want to hear these scientists and engineers from the whole, wide wonderful world of metals . . . outstanding metal men from the United States, Canada and the entire free world . . . more than 38 countries will be represented. You will want to listen, to discuss, to meet the men who are creating this world of metals.

You will want to be in Chicago to see the vast array of metalworking products and equipment that will be displayed by more than 500 leading firms at the Metal Show — the 39th National Metal Exposition — in the International Amphitheatre and Exposition Hall. This will be the greatest display of metals and metalworking equipment. Here, in one week, you will see more products, talk with more metalworking experts, than in a year of travel.

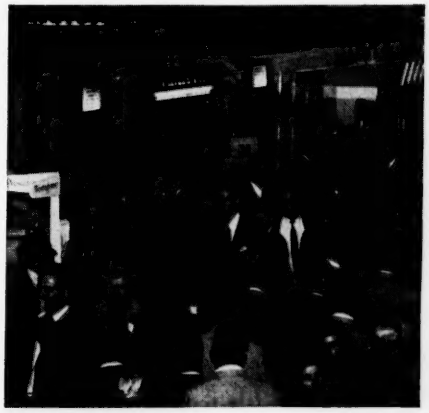


Exhibit Space Available

Hundreds of manufacturers have reserved Metal Show space, but there are good locations still available in the vast new exposition halls of the International Amphitheatre. If the metalproducing or metalworking industries are your market, don't miss this show — write for display information now.

You will want to be in Chicago with your associates from management, engineering, production and sales.This will be a world event you will long remember — and from which you will obtain ideas and knowledge to meet the metalworking problems of today and tomorrow. Make a date now — to be in Chicago, the week of November 4. For hotel reservations write: Metal Show Housing Bureau, c/o Chicago Convention Bureau, Inc. 134 N. LaSalle Street, Suite 900, Chicago 2, Illinois.

Cooperating Societies: Metals Division, American Institute of Mining, Metallurgical and Petroleum Engineers . . . the Society for Non Destructive Testing . . . the Industrial Heating Equipment Association.

AMERICAN SOCIETY FOR METALS

The Engineering Society for the Metal Industry

7301 Euclid Avenue

Cleveland 3, Ohio

HOLDEN SALT BATHS FROM STOCK

LIQUID CARBURIZING BATHS AND CARBON REAGENTS—WATER SOLUBLE

	Case Depths	Operating Temperature Range	
Light Case 50	.001 - .005	1400 - 1650°F.	Carbon A
Light Case 200	001 - .010	1400 - 1650°F.	Carbon D
Hard Case 250	.001 - .025	1400 - 1650°F.	Carbon E
Hard Case 400	.001 - .040	1450 - 1750°F.	
Hard Case 500	.001 - .075	1450 - 1750°F.	
Hard Case 600 for replenishment only		1450 - 1750°F.	

HOLDEN NEUTRAL SALT BATHS WITH ADDITIVES REQUIRE NO RECTIFICATION

DO THE FOLLOWING THINGS:

1. Increase electrode life. 2. Increase ceramic pot life. 3. Increase alloy pot life.

NEUTRAL SALT BATHS with ADDITIVES

Hardening 185-10	1000 - 1500°F.
Hardening 127-11	1300 - 1650°F.
Hardening 127-12	1300 - 1650°F.
Hard Brite AA-10	1450 - 2000°F.

High Speed Hardening Baths with Additives

High Speed Preheat 13-17-10	1200 - 1700°F.
High Speed 17-24AA-10	1750 - 2350°F.
High Speed 17-22AA-10	1700 - 2300°F.
Hy-Speed Case	950 - 1150°F.

NO METHYL CHLORIDE OR CARBON STICK REQUIRED WITH HOLDEN BATHS

TEMPERING BATHS:

Tempering 2	500 - 1100°F.
Tempering 310A, fused	325 - 1100°F.
Tempering 350 Pink	325 - 1100°F.

NON-EXPLOSIVE Tempering Salt Bath 600 to 1200° F. Osquench 3300-10

MARQUENCHING & AUSTEMPERING:

Marquench 296 —

Marquench Additive 356,—to clear up chlorides in austempering-martempering baths.

RECTIFIERS:

Rectifier A—for special descaling operations or added cleaning.

QUENCHING OILS:

Clear Quench Quench 500 Martoil Martoil K

☐ WE ARE INTERESTED IN YOUR LEASING PLAN FOR INDUSTRIAL FURNACES

LEASING CONSERVES WORKING CAPITAL AND INCREASES PROFITS

SEE INSIDE FRONT COVER FOR FREE LITERATURE

THE A. F. HOLDEN COMPANY

3 F.O.B. Points for Holden Metallurgical Products

EXECUTIVE OFFICES AND PLANT
• 14341 SCHAEFER HIGHWAY,
DETROIT 27, MICHIGAN

EASTERN PLANT
• 460 GRAND AVENUE,
NEW HAVEN 13, CONN.

WESTERN PLANT
• 4700 EAST 48th STREET
LOS ANGELES 58, CALIF.